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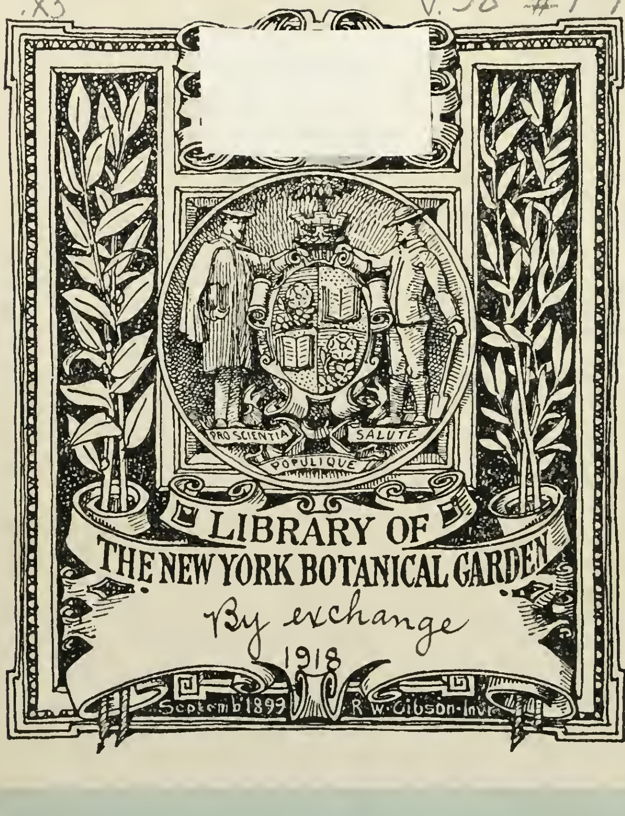
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VOLUME XXXVIII

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[1] On leave of absence for military service.

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[1] Printed in scientific and technical publications outside the Department.

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EXPERIMENT STATION RECORD.

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It is a sign of the spirit of public service pervading the American experiment stations that their workers should feel an insistent desire for a real tangible part in the country's supreme effort. Living in the midst of the greatest war ever waged, and in the most momentous period of the world's history, it is difficult to understand how any man, much less a scientist, can escape being brought under the spell of its appeal. To many of this class it has been a call to service under arms, to others for special expert service under the Government, and to many it has made it difficult to long hold their minds on work which is not definitely related to the situation. It has aroused the spirit of public usefulness.

The war has not only given every one opportunity to help, no matter what his walk in life, and stimulated action by emphasizing the common interest, but it has created an obligation and an expectation which have a new force in our lives. As a speaker at the winter meeting of the American Association for the Advancement of Science well said: "There has never been a time in the world's history when every individual, every nation, organizations of every kind, every science, and every other intellectual discipline have been under such compelling necessity of demonstrating their usefulness."

And he added that "the most savage assault ever made on civilization, wrecking universities, bombarding churches and schoolhouses, burning libraries, destroying orchards and forests, ruining laboratories and scientific apparatus, has compelled every nation, every department of knowledge, to become as useful as possible." Hence, "society is justified in asking of every scientist as of every other man, of what use can you be in the body politic?"

This question has stirred the forces of the experiment stations from the outset. Sometimes the glamour of war makes the opportunity seem to lie afar off, outside the ordinary walks of life. And this makes men restless and impatient of work which seems remote from the field of action. It has led some away from the institutions, and created uncertainty in the minds of others as to what they ought to do. The provision for deferred classification of agricultural

specialists has served to relieve the unrest among younger men by giving security in their work, but there is still some feeling of uncertainty whether service does not imply a change of activity.

There are some classes of specialists who are particularly needed by the Government because the demand for experts has so enormously increased, and included in these are many from the agricultural colleges. But let us not forget that the big work is not all on the firing line. A vast amount that is absolutely fundamental and indispensable lies a long way in the rear. Back of the military preparation and supporting efforts rest a great number of groups whose services are none the less imperative because remote, and which are taking a vital part in the conflict, each fighting in its own way.

Agriculture has assumed a place of imperative importance in the progress of the war. Before the first year was over the commander of the French forces declared food production to be second only in importance to the military operations and munitions supply, and this has been emphasized in all the countries at war with each succeeding year. Agriculture has become not only a national but an international requirement, and food production and control have taken rank as a military necessity. Food has become a matter of grave concern to America and her Allies, and the shortage of staples and need of strict economy in their use has been brought home to us in some measure in this country during the past few months. Adequate supply is one of the most important means of strengthening the Allies and their armies, physically and psychologically.

The American farm is the great base of food supplies. In order that the requirements may be met supreme effort is necessary, coupled with the highest attainable efficiency and most profitable employment of resources. The guidance and aid and stimulation of the great agricultural institutions of this country may go a long way in accomplishing this end and in furnishing the means of overcoming the controllable factors in production and utilization.

The experiment stations are a strong and indispensable link in the comprehensive American system of agricultural institutions. They stand back of the forces that are shaping the plans and giving practical aid and stimulation to the producers in the field. They are not alone public institutions; they are part of a national system and as a body are auxiliaries of the General Government, working for one great end. Their staffs form a part of the agricultural corps, engaged in service only second in importance to the military operations. While this agricultural corps is organized mainly along State lines, and is not a unified part of the military organization, it is no less a great factor in furthering the ends for which the military branches are striving. Recognition of this gives the position of the workers in these institutions high importance. It makes it plain that the

majority of station workers may render greatest service by remaining in the positions they now occupy, if they are alert and determined to make their efforts count. They are needed there more than elsewhere, and by remaining they may take quite as definite and essential a part in aiding the final result as if they transferred to another branch. The qualities of the leader or the product of initiative may find expression quite as much there as in a larger aggregation, and the result is likely to stand out quite as prominently.

The workers need to feel this, and to be encouraged to do the things which will promote that feeling by satisfying their desire for active service. They need to look upon themselves, as the extension forces do in many States, as a vital part of a great agricultural army, whose efforts are vital in the same way as the investigators in the gas service or the food supply of cantonments, or any other line of expert war work. Then they may feel that they are helping to win the war even though they are not working in the camps or a Government office. They will see that their greatest usefulness as experts usually lies back in their institutions, in close contact with their constituency.

It is inevitable that the war should result in much hardship to the experiment stations through loss of men, and make more difficult their task of maintaining their usual lines of activity. Already some stations have been severely crippled by these losses, and the difficulty of making the places good has been at least a temporary setback to their work.

One saving circumstance, however, is the fact that the losses have been quite largely among the younger men. For the most part the heads of departments and more important staff members have remained, although there are some instances where these have been attracted to expert service with the Government or in commercial establishments. To some extent associates and assistants capable of doing independent work have left for other fields, and even skilled laborers, so essential to certain kinds of greenhouse, plat and feeding experiments, have been taken or attracted by larger wages. In some of the southern stations, for example, it was necessary the past season to employ negro women for such work, as the only labor available.

But the retention of so large a proportion of the leaders has preserved the station organization and left a basis on which to continue its established or modified lines of activity. These remain to block out the plans and supply the expert judgment so essential in this class of activity. The burden upon them has been increased, for with less trained and experienced assistants they must look more carefully to direction and supervision. Their resourcefulness and ability to adapt means to ends must be relied upon. This condition

will entail more planning and supervision, from the director's office down through the various departments.

This depletion of station forces will of itself entail some necessary changes in the station projects. Many a man has gone whose place can not be filled and who has left a line of study which must be temporarily laid aside. This condition will increase the need of concentrating on essential lines and utilizing the forces to best advantage. In some respects it may require doing a larger proportion of work which makes less demand for specialization; and this would not be without some advantage, for many of the current needs are of that class.

One means of relief which is open and which might be followed more largely than it has been is the employment of women. There are many college trained women who have specialized in some branch of science and taken graduate work to further fit them for high grade service. They have perhaps rarely had contact with agricultural matters or problems, but they can be trained to the agricultural viewpoint. As a class they are as well adapted as men to many of the operations required in experimental work, in the laboratory and outside. A considerable number who have been tried in the past have proved highly efficient and in all respects desirable. In some of the stations they have risen to the position of head of department; in others, they have become experts in chemical analysis, in bacteriological technic, in entomology, in the study of plant diseases, in breeding investigations, in the handling of poultry, and in many other similar lines. There is nothing in the nature or requirements of such service which unfits them or makes them less promising than men, and there is reason to believe that they might profitably be employed to larger extent.

While the primary duty of the experiment stations at this time is to help win the war, the question has been as to how this can be done to best advantage, having in mind both the present and the future. Although individually or as a class they have not remained indifferent and have been quick to take on added responsibilities, there has been some evidence of doubt as to how far the situation warrants or makes desirable a departure from the established program and the usual lines of activity. This is an honest and a patriotic question, for the war is temporary while agriculture is permanent, and there is to be a great period of adjustment and reconstruction after the war. The world conflict will not alter the content of science but will serve to increase dependence upon it.

The best the stations can do in the main is, while relating their work and the results secured in the past to the special needs of the present, to preserve their organization and aims, to maintain their

attitude toward experimental inquiry, and to continue to serve in the capacity of experts in agricultural science and in its interpretation in practice. But in this they will need to be governed by existing conditions to an unusual degree. In the past they have wisely been engaged to a large extent in developing the basis for permanent agriculture, and this has led them into lines of study which have become increasingly technical and fundamental. Now, the unusual conditions and the insistent demands laid on agriculture, call for such a temporary adjustment as will relate their activities, in part at least, quite closely to the problems at hand.

They need to be brought definitely into the emergency campaign. In many places this step was taken long ago, at least informally, but in others the effort has not been organized or expressed in the program, and a considerable part of the staff has been but little affected by it. This is doubtless due to design rather than oversight, and is founded in a belief that the station can be of greatest service by continuing its work in the usual way.

Intellectual leadership, sound counsel, and expert study in the light of present conditions are services for which the stations will be looked to. Obviously this is no time for "business as usual." Our most urgent business is to win the war; and in a great service system like the experiment stations, each unit should be an answer to the question of what is being done to help win the war.

The needs of the Nation in time of emergency are abundant justification for such temporary change and adjustment as necessary, for they are paramount considerations. The subjects worthy of our best thought and highest endeavors are those which deal with utilizing our science and directing it to questions and procedure which are just now vital.

This will suggest the desirability of some revision of the station's program, not with a view to changing the general character and purpose of the activity but of adapting it for the time being to the unusual conditions. In this way the station's energies and resources may be directed to subjects having a present importance and likely to be of practical rather than general theoretical interest. Emphasis would be laid upon emergency topics, and more time gained for special expert services.

Some projects can be eliminated or postponed, because they are not pressing and can readily wait; others may be brought as speedily as practicable to a point where they can be placed on the inactive list without detriment to what has been done, or may be given a trend which will make them meet more immediate needs; still others may be singled out which from their nature are so timely and important that they ought to be pushed vigorously.

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It need hardly be said that such a sorting of projects will require thoughtful and sympathetic consideration of the nature and special requirements of established lines. Violent and sweeping changes are not to be advised. No one would wish to see systems of plat experiments abandoned, or long-time breeding studies interrupted, or investigations disturbed for which special provision has been made in the form of herds, flocks, orchards, or other living collections. But there are other lines where interruption would be less serious.

The real question is how the stations can make their work most useful, while remaining in their recognized field. Without taking any narrow view it will be evident that the study of fundamentals which have no particular present application to agriculture or the changing situation in view will be less imperative and may often be laid aside temporarily for those promising more direct benefits. Furthermore, in deciding upon new lines or projects, their suitability at this time evidently ought to receive unusual consideration. Service where it is needed should be the watchword.

One important relationship which should be especially emphasized is that of the station to the extension service. As the station's duty lies primarily in the field of providing reliable knowledge and advice, it is highly important that unusually close and helpful relations be maintained with the extension service which has been enlarged to assist in translating this useful knowledge into practice.

Such relations have not always prevailed in the past. Indeed, there are cases in which little or no intercourse has existed, and in others the gap between the station and the extension organization and forces has frequently been too wide. This does not make for efficiency. It weakens both branches of service very materially.

There is an interdependence between these two agencies. While separate in organization, they are by no means independent of each other, but for the highest results they are mutually dependent upon one another. They can ill afford to work independently, especially at such a time as this. Recognizing the special field and function of each of these services, it seems clear that, especially in this emergency, it is incumbent upon the experiment stations to see to it that their results are adequately extended to the people. This does not mean that station men are to carry the results themselves in any regular way, or serve as extension specialists, but it implies working in very close contact with the extension forces, interpreting the results of station work to them, maintaining a touch with the farming people through them, keeping advised of the special needs of the times, and supplying the answer as far as possible.

Everything points to the necessity of concentrating our efforts. The two agencies need to advise and counsel together. The stations

can guide and sustain this army of busy workers, answer the questions which come to them in their every-day experience, and make their teachings doubly sure. Just as in normal times the stations are to replace tradition and opinion by reason, and uncertainty by hard facts, so now they will need to furnish much of the knowledge and procedure to guide the farmer and his advisers.

The station's experts should also be in position to help in planning the extension campaigns and the programs for larger production. This is an unusual form of activity it is true, but the times are unusual. Teachings and plans should be safe and sane, and all the counsel possible is needed. The suggestions and advice to be offered to the farmers ought to be tested in the crucible of the station's expert understanding, and should be considered broadly as to their effect and in relation to present economic and other conditions. The station experts ought to be at the council table when the agricultural needs are being considered and the plans and programs are being worked out. This has not always been the case in the past.

It is not necessary that the station workers should step out of their character as experts in agricultural science and its interpretation to accomplish these things. They will usually be more useful in that capacity than if they attempted to take the place of extension workers. They need, however, to adapt their attitude and their vision toward the work at hand so that they will observe and consider conditions outside the technical aspects of their investigations, and be alert to realize the full measure of their opportunity.

It is one of the essential attributes of the station investigator that he should understand the field so as to know what is most needful. He must discover the problems, or if not must be guided by those who do, and he needs now especially to familiarize himself definitely with the actual conditions of farming and to take a practical view of his work and its use. Economic conditions are changed; so is the labor situation and the fertilizer supply, and the problem of transportation. Hence theory in relation to practice needs to be revised, frequently on the basis of new experiments.

There is still some disposition to look upon the stations as makers of theories and fundamental conceptions not closely related to the immediate needs of the situation. The attitude of the stations should be a decisive answer to this. It is not a time for the pursuit of theory for the sake of theory, but for the application of theory and the result of experiment to practical conditions.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Maple sugar: Composition, methods of analysis, effect of environment, A. H. Bryan, M. N. Straughn, C. G. Church, A. Given, and S. F. Sherwood (*U. S. Dept. Agr. Bul. 466 (1917), pp. 46, figs. 2*).—This bulletin gives the definitions of maple sugar and its products and the procedure for sampling, and outlines the methods of analysis. Analytical data of samples collected during the seasons 1910, 1911, and 1912 from Indiana, Maine, Maryland, Massachusetts, Michigan, New Hampshire, New York, Ohio, Pennsylvania, Vermont, West Virginia, and also from Quebec, Canada, are submitted in tabular form and the results obtained discussed. The data include the physical properties of color and taste; the determination of sucrose, invert sugar, undetermined sugar, total ash, soluble ash, insoluble ash, ratio of soluble ash to insoluble ash, alkalinity of the soluble and insoluble ash; tannin reaction; the Winton and the Ross lead numbers; and malic acid value.

The effect of environment on the composition of maple sugar; changes in composition and color from sap sirup to sugar sirup; moisture in maple sugar; and maple cream, honey, and wax are briefly discussed. Some comparative data of American and Canadian products are also submitted.

The following analytical figures are considered to be the minimum for pure maple products, as judged by the analytical data obtained in the investigation: Total ash, 0.77 per cent; insoluble ash, 0.23 per cent; Winton lead number, 1.85; and malic acid value, 0.6, all results being calculated to a dry basis.

The fermentation of Philippine cacao, H. C. Brill (*Philippine Jour. Sci., Sect. A, 12 (1917), No. 1, pp. 1–15*).—The fermentation of "criollo" and "forastero" cacao for varying lengths of time and the influence of enzyms and yeasts on the fermentation was investigated. The results indicate that the fermentation is the joint result of the reaction of yeasts and enzyms.

It is concluded in general that "the Philippine Islands can grow a good quality of cacao in large quantities and that the time seems opportune for such an innovation."

Tabular data are given showing the production and consumption of cacao by countries, average weight of fruits and seeds of Philippine cacao, analytical data of Philippine cacao and cacao from various other sources, and properties of cocoa butter from Philippine cacao. See also a previous note (E. S. R., 35, p. 414).

[Notes on essential oils], Puran Singh (*Indian Forest Rec., 5 (1917), No. 8, pp. II+39, pls. 6*).—Three papers are here presented.

I. *The eucalyptus oil industry in the Nilgiris* (pp. 1–26).—This is a discussion of the subject under the topics of a summary of the literature on eucalyptus oil and its distillation; the blue-gum oil distillation in the Nilgiris; the oil from the Nilgiri blue gum, its yield and composition; cost of distillation of eucalyptus oil; and an appendix on the design of the most economical still for eucalyptus oil distillation in the Nilgiris.

II. *Distillation of geranium oil in the Nilgiris* (pp. 27–32).—The subject is discussed under the topics of botanical identification, a summary of the literature on geranium oil, yield and composition of the oil, constants of the geranium oil of European commerce, production and trade, cultivation of geranium, and field experiments with a view to determining the yield and constants of the Nilgiri oil.

Cultivation of geranium is encouraged as an auxiliary crop for the use of eucalyptus distillers. An oil of excellent aroma having 46.6 per cent of free geraniol and 28.19 per cent of combined geraniol was obtained.

III. *Manufacture of wintergreen oil in India* (pp. 33–39).—This reports the results of an experimental study relative to the supply of raw material, yield of oil, cost of production, cartage, packing, etc.

The results of the study have shown that the Nilgiri plant is too poor in oil content to be considered as a commercial source of oil of wintergreen.

The presence of arsenic in hops, W. W. Stockberger and W. D. Collins (*U. S. Dept. Agr. Bul. 568 (1917), pp. 7*).—Data are presented which show that sun-dried hops collected from various yards in Oregon during 1915 contained practically no arsenic. The spraying materials in general use are not considered to be responsible for the contamination of hops with arsenic. The sulphur used for the hops collected was generally found to be contaminated with arsenic. It is indicated that "little, if any, doubt remains that impure sulphur alone is responsible for the contamination of hops with appreciable quantities of arsenic."

The analytical data are submitted in tabular form.

See also a previous note (E. S. R., 19, p. 1007).

Some enzyms of germinating red gram (Cajanus indicus), B. Viswanath (*Agr. Jour. India, Indian Sci. Cong. No., 1917, pp. 109–116*).—Investigations reported show the presence of an ereptase, amylase, cytase, maltase, sucrase, oxidase, lipase, and urease in an aqueous extract of the germinated red gram, or dholl (pigeon pea). No peptase was found in the normal seed. Hydrolysis of the reserve protein was found to take place at a late stage in the germination. Whether this hydrolysis is due to a protoplasmic activity or to the secretion of a separate enzym in the course of germination is indicated as still being doubtful.

The use of textile fibers in microscopic qualitative chemical analysis, E. M. Chamot and H. I. Cole (*Jour. Indus. and Engin. Chem., 9 (1917), No. 10, pp. 969–971*).—The authors describe a method for the detection of alkalinity and acidity in minute drops of liquid by means of silk fibers impregnated with litmus. Congo red viscose silk fibers could be used only for the detection of acidity. Acidity due to mineral acids yielded positive results in solutions as dilute as $\frac{1}{4,500}$-normal. The indicator fibers were found not to be quite so sensitive to alkali. The sensitiveness of the indicator fibers was found to vary with the degree of adsorption of the dye and the degree of purification of the raw silk and of the litmus used.

It is indicated that Congo red fibers can not be used to differentiate organic acids from mineral acids.

The preparation of fibers and the technique of the determinations, together with a modified procedure for preparing an exceedingly pure litmus, are described in detail.

An electrically heated and controlled air bath, W. P. Schuck (*Jour. Indus. and Engin. Chem., 9 (1917), No. 10, pp. 973, 974, fig. 1*).—The construction and operation of the apparatus are described in detail. The cost of materials required to make the ordinary air bath electrically heated and controlled was $1.50, exclusive of the platinum contact points.

A useful distilling head, O. Stearns (*Jour. Indus. and Engin. Chem., 9 (1917), No. 10, pp. 972, 973, fig. 1*).—A distilling head which has been found useful for liquids which froth easily or have a tendency to bump is described by a figure.

The separation of aluminum from iron by means of ether, S. Palkin (*Jour. Indus. and Engin. Chem., 9 (1917), No 10, pp. 951–953*).—The essentials of the method described are as follows:

The dried mixed chlorids of aluminum and iron are taken up in a small amount of hydrochloric-acid-alcohol solution and evaporated to crystallization of the salts. The residue is again acidified with alcoholic hydrochloric acid, and ether which contains a trace of water gradually added. The aluminum is precipitated as a hydrated chlorid varying in composition while the ferric chlorid remains in solution. The precipitate is separated by filtration and the aluminum precipitated from an aqueous solution of aluminum chlorid as the hydroxid, filtered, ignited, and weighed with the usual precautions. The ether solution of iron is distilled or evaporated to remove the ether, the residue transferred with a little water and hydrochloric acid to a weighed platinum dish (using as little water as possible), and evaporated to dryness on the steam bath. The residue is moistened with 1 cc. concentrated sulphuric acid, gently warmed on the steam bath to expel most of the hydrochloric acid, and slowly heated over a flame on an asbestos gauze until all the ferric chlorid is converted to the sulphate. It is then heated over a free flame, and finally over the blast lamp to convert the sulphate to ferric oxid. The oxid is cooled and weighed in the usual manner.

The procedure is described in detail, and analytical data submitted which indicate the accuracy of the procedure. Essential data obtained in the study of the effect of moisture, alcohol, and hydrochloric acid on the accuracy of the method are also submitted.

The determination of sulphur dioxid, O. R. Sweeney, H. E. Outcault, and J. R. Withrow (*Jour. Indus. and Engin. Chem., 9 (1917), No. 10, pp. 949, 950*).—Data are submitted which indicate that potassium permanganate is to be preferred to iodin for the determination of sulphur dioxid. It gives as great accuracy, is as easy to prepare, can be more easily manipulated, can be used for traces as well as large amounts of sulphur dioxid, is more stable to light, gives a color as easy or easier to match than the starch-iodin end point, and requires no simultaneous blank, consequently less apparatus to be transported in the field.

The details of the manipulation of the method are the same as those of the iodin method used by the Selby Smelter Commission (E. S. R., 34, p. 716).

The effect of temperature on the reaction of lysin with nitrous acid, B. Sure and E. B. Hart (*Jour. Biol. Chem., 31 (1917), No. 3, pp. 527–532*).—Data are submitted by the authors, at the Wisconsin Experiment Station, which show that at definite concentrations 32° C. is the lowest temperature at which both amino groups of lysin react with nitrous acid in 5 minutes. At certain definite concentrations 30° was the lowest temperature at which both groups reacted with nitrous acid in 10 minutes.

It is suggested that "at temperatures of 30° C. and above, 10 or a maximum of 15 minutes would be more than sufficient for shaking the hexone bases in the Van Slyke method [E. S. R., 26, p. 22] of protein analysis, at any concentration, instead of 30 as was the practice heretofore." It was found possible to render the ε-amino group of lysin entirely inactive at temperatures of 1° and slightly below with certain definite concentrations.

The determination of phytin phosphorus in plant products, J. B. RATHER (*Arkansas Sta. Bul. 135 (1917), pp. 3–15; abs. in Jour. Amer. Chem. Soc., 39 (1917), No. 11, pp. 2506–2515*).—The author has found that the ferric chlorid titration method of Heubner and Stadler (E. S. R., 34, p. 10) for the determination of phytin phosphorus in pharmaceutical products is applicable to plant products with some slight modifications which the nature of the materials demands. The method, however, does not appear to yield satisfactory results with dried forage plants.

"The ratio of iron to phosphorus in determinations of phytin phosphorus as ascertained by titrations of purified salts of inosit pentaphosphoric acid obtained from Kafir corn, cottonseed meal, wheat bran, corn, rice bran, and rice polish, was found to average 1.207. Heptaferric inosit pentaphosphate would have the ratio 1.191."

Of the plant products examined, wheat bran, rice polish, cottonseed meal, wheat shorts, and rice bran were found to contain the largest amounts of phytin phosphorus, while the smallest amounts were found in corn, oats, soy bean, clover seed, and Kafir corn. The phytin phosphorus in the plant products examined constituted on an average 73 per cent of the total phosphorus and 86 per cent of the 1.2 per cent hydrochloric-acid-soluble phosphorus.

The bacteriological examination of food and water, W. G. SAVAGE (*Cambridge, England: University Press, 1916, 2. ed., pp. X+200, figs. 16*).—This is the second edition of the work previously noted (E. S. R., 32, p. 311). The new edition contains an addendum in which the recent advances and new methods which facilitate the examination of food and water are summarized.

A method for the determination of the volatile oil content of citrus fruits, C. P. WILSON and C. O. YOUNG (*Jour. Indus. and Engin. Chem., 9 (1917), No. 10, pp. 959–961, fig. 1*).—The extraction methods for the determination of the volatile oil in citrus fruits not having been found to be very satisfactory, the authors modified the steam distillation method and found it to be the most practical procedure thus far developed. A special calibrated receiving flask similar to a Babcock milk test bottle, the body having a capacity of 200 cc. and the neck of 2 cc., the latter graduated in 0.1 cc., was designed and is described. The weight of the oil is calculated by the formula

$$V \times 0.849 \times 0.996.$$

V being equal to the volume of the oil collected, 0.849 being the average specific gravity of California lemon oil, and 0.996 a correction factor for determinations made at 25° C. in the air. For rapid and reasonably accurate work the weight of the oil may be obtained by multiplying the volume obtained in the distillation by 0.846.

Determination of sugar in baked articles (*Jour. Soc. Chem. Indus., 36 (1917), No. 15, pp. 856, 857*).—Procedures for the preparation of the sample and the determination of moisture in biscuits, large cakes, buns, small cakes, and articles containing fruit (raisins, currants, dates, etc.) in which sugar naturally occurs, agreed to at a conference between the Government chemist and representatives of the Society of Public Analysts and of the biscuit manufacturers of Great Britain, are submitted.

Detection of added water in milk by means of a simplified molecular concentration constant, L. W. FERRIS (*Jour. Indus. and Engin. Chem., 9 (1917), No. 10, pp. 957–959, fig. 1*).—Thirty-one samples of milk were analyzed which showed values for the molecular concentration to be between 71.1 and 82.6 as calculated by the method of Mathieu and Ferré (E. S. R., 33, p. 208). The development of acidity in the milk was found to have the same effect upon the molecular concentration constant as the addition of water. The use of for-

maldehyde as a preservative is, however, permissible. The application of the method to three samples of milk to which 8 per cent of water was added indicated the presence of the added water by marked reduction of the molecular concentration. It is stated that "if a sample of milk can be examined while fresh the freezing-point method is more accurate, but if it is desired to preserve the sample the determination of the molecular concentration constant is better for the detection of added water in milk."

The analytical data are submitted in detailed tabular form.

The distribution of the fatty acids in the milk fat of the cow and sheep, C. Crowther and A. Hynd (*Biochem. Jour., 11 (1917), No. 2, pp. 139–163*).—A method for the determination of fatty acids which consists essentially in converting a suitable sample of the fat to the methyl esters of the fatty acids by heating in ethereal solution with an excess of methyl alcohol containing a small percentage of hydrogen chlorid is described in detail. The mixed esters are carefully separated from the reaction and fractionally distilled three or four times, the distillation in each case being made under atmospheric pressure, until a temperature of 150–160° C. is reached, the fractionation being subsequently completed under a pressure of about 15 mm. A series of fractions, each assumed to contain only two saturated esters and one unsaturated ester, the latter being further assumed to be methyl oleate, is thus obtained. Experimental data in support of these assumptions are submitted. The iodin value and the saponification value of each fraction is then determined, and from these figures the weight of each ester in the fractions calculated. From the weights of the esters the weight of each acid in the original sample is finally obtained. The calculation of results is described.

Analytical data obtained in the use of the method and showing the fatty acids of the fat of cow and ewe's milk, of an artificial mixture of fatty acids, and the fat from the "first runnings" of milk are submitted in detail. The data obtained from the artificial mixture of fatty acids indicate the accuracy of the procedure.

A modification of the Price method for the separation of the permitted coal-tar colors to include tartrazin, E. H. Ingersoll (*Jour. Indus. and Engin. Chem., 9 (1917), No. 10, pp. 955–957*).—The author found the method described by Estes (E. S. R., 36, p. 714) to be unsatisfactory and has proposed a modification of the Price method (E. S. R., 25, p. 502), which is described in detail.

Drying fruits and vegetables in the home (*U. S. Dept. Agr., Farmers' Bul. 841 (1917), pp. 29, figs. 19*).—This publication discusses reasons for drying fruits and vegetables and principles and methods of drying and preparation of food for the drier; describes apparatus used for drying; and gives directions for drying various fruits and vegetables, precautions against insects, directions for packing and storing, and recipes for cooking dried fruits and vegetables.

Home canning by the one-period cold-packed method, O. H. Benson (*U. S. Dept. Agr., Farmers' Bul. 839 (1917), pp. 39, figs. 24*).—This is a general discussion of the cold-pack method of canning, together with detailed directions for canning various fruits and vegetables, special canning precautions, a time table, and suggestions. Directions for handling and sealing containers are given in an appendix.

The methods described are those taught to canning club members in the Northern and Western States.

Home canning of fruits and vegetables, Mary E. Creswell and Ola Powell (*U. S. Dept. Agr., Farmers' Bul. 853 (1917), pp. 42, figs. 18*).—This publication discusses canning, other methods of conservation, and sterilization; de-

scribes equipment for canning in the home, canning in glass with directions for various fruits and vegetables, canning in tin, standards for 4-H brand canned fruits and vegetables; gives directions for making jams, fruit butters, marmalades, and jelly; and briefly discusses preserving. Time tables for canning fruits and vegetables are included.

The methods described are those taught to canning club members in the Southern States.

The sanitary control of tomato-canning factories, B. J. HOWARD and C. H. STEPHENSON (*U. S. Dept. Agr. Bul. 569 (1917), pp. 29, pls. 2, figs. 3*).—This bulletin discusses the findings of an inspection of several tomato-canning factories in which defective methods of cleaning the apparatus or inadequate sorting methods were found responsible for insanitary products, and discusses the operations of washing, assorting, trimming, and pulping, pulp-making systems, promptness in handling, cleanliness in the factory, and laboratory control.

Methods of preparing salmon, J. N. COBB (*U. S. Dept. Com., Bur. Fisheries Doc. 839 (1917), pp. 118–146, pls. 12*).—These pages describe the salmon canning industry of the Pacific Northwest and give notes on mild curing, pickling, dry-salting, smoking, freezing, the utilization of salmon eggs, and miscellaneous products, including meal, fertilizer, and oil.

Home manufacture of furs and skins, A. B. FARNHAM (*Columbus, Ohio: A. R. Harding, 1916, pp. 285, figs. 91*).—This volume gives practical instructions on how to tan, dress, color, and manufacture or make into articles of ornament, wear, and use furs and skins. The subjects treated in general are facts and general principles for fur and skin workers; correct modes of skinning fur animals; stretching, curing, and handling fur skins and hides; storing and shipping raw furs; tools and appliances for tanning and dressing; tanning materials; terms, formulas, and recipes; preliminary work—soaking, fleshing, degreasing; softening and cleaning skins; small or light furs; heavy furs; deer skins and buckskin; sheep and goat skins, etc.; uses and principles of fur dyeing; furriers' tools and supplies; making up furs, garments, robes, rugs, coats, capes, caps, gloves, muffs, neck pieces, etc.; utilizing fur waste; cleaning, repairing, and storing; and prices for tanning and other fur work.

METEOROLOGY.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 4 (1917), Nos. 5 [221], pls. 2, figs. 5; 6, pp. [216], pls. 2, figs. 4*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for May and June, 1917.

Meteorological records for 1915 (*New York State Sta. Rpt. 1915, pp. 983–994*).—Tables are given showing tridaily readings at Geneva, N. Y., of standard air thermometers for each month of the year; daily readings of maximum and minimum thermometers at 5 p. m. for each month of the year; a monthly summary of maximum, minimum, and standard thermometer readings for the year; monthly and yearly maximum and minimum temperatures from 1883 to 1915, inclusive; average monthly and yearly temperatures since 1882; and rainfall by months since 1882.

[Meteorology for 1914], H. D. EDMISTON (*Pennsylvania Sta. Rpt. 1915, pp. 425–433, 497–521*).—The observations here recorded are of the same character

as those reported in previous years (E. S. R., 35, p. 508). The summary for 1914 is as follows:

Summary of meteorological observations at State College, Pa., 1914.

Kind of observation.	1914	Growing season (April–September).
Barometer (inches): Mean [1]	30.031	
Temperature (° F.):		
Mean	48.7	63.5.
Highest	95.0 (Aug. 20)	95.0 (Aug. 20).
Lowest	−15.0 (Jan. 14)	20.0 (Apr. 4).
Greatest daily range	45.0 (June 17)	45.0 (June 17).
Least daily range	1.0 (Jan. 4, Nov. 16)	
Rainfall (inches)	31.01	16.24.
Number of days on which 0.01 in. or more rain fell	117	55.
Mean percentage of cloudiness	51.0	44.0.
Number of days on which cloudiness averaged 80 per cent or more.	116	41.
Last frost in spring		June 16.
First frost in fall		Sept. 5.

[1] Exclusive of March and April.

Forest climate of Switzerland (*Rev. Sci.* [*Paris*], *55* (*1917*), *No. 16, pp. 498, 499*).—The variations of temperature and precipitation at different altitudes and varying conditions of exposure and forest cover are discussed.

Observations at the Stavropol meteorological station, I. G. Cherkashenko (*Stavropol-Kavkaz. Selsk. Khoz. Opytn. Sta., Mat. 1905–1912, Nabliud. Met. Sta. Zapad. Opytn. Polia, No. 1* (*1913*), *pp. 6*).—Tables are given showing the temperature of the air and the precipitation for eight years (1905–1912), as well as the temperature and precipitation for the years of highest and lowest crops of winter wheat during that period.

Dates of the last spring and first autumn frosts and the average times of sowing and harvesting the principal crops of the region are also given. The average date of the last spring frost, 1904–1912, was April 19; of the first autumn frost, October 8. The average seedtime and harvest dates, 1901–1912, were as follows: Beginning of seeding of winter wheat, September 16, beginning of harvest, July 14; spring cereals, March 26, July 12; potatoes April 8, September 10; corn, April 18, September 21.

The amount and distribution of temperature and precipitation for the years giving the highest and lowest yields of winter wheat are shown in the following table:

Temperature and precipitation for the highest and lowest yields of winter wheat, 1905–1912.

Month and year.	Average temperature.			Precipitation.		
	Highest yield.		Lowest yield, 1907–8.	Highest yield.		Lowest yield, 1907–8.
	1909–10.	1911–12.		1909–10.	1911–12.	
	Degrees F.	*Degrees F.*	*Degrees F.*	*Inches.*	*Inches.*	*Inches.*
August	20.0	18.9	18.8	20.4	39.1	6.1
September	18.7	12.5	11.9	63.4	66.8	53.6
October	10.0	7.2	8.4	.8	40.1	5.2
November	6.7	4.1	− 1.8	57.0	16.6	31.9
December	.3	− 3.4	− 2.2	21.2	11.5	34.9
January	− 2.2	− 3.2	− 5.7	22.1	12.4	23.0
February	− 2.4	− 2.6	− 2.8	16.6	32.9	23.3
March	1.1	2.8	− 1.7	14.0	11.9	21.8
April	8.3	5.3	6.0	58.4	59.0	36.0
May	13.4	11.0	12.7	94.8	81.7	68.0
June	17.9	17.7	18.5	85.4	104.1	69.2
July	21.3	17.5	19.8	74.0	137.3	74.9
Whole year	9.4	7.3	6.8	528.1	613.4	447.9

The highest yields were about 35 bu. of grain and 6,400 lbs. of straw per acre. The lowest yield was about 14 bu. of grain and 2,050 lbs. of straw.

Desiccation of Africa, R. L. Harger (*Jour. East Africa and Uganda Nat. Hist. Soc., vol. 6, No. 11; abs. in Nature* [*London*], *99* (*1917*), *No. 2487, p. 352; U. S. Mo. Weather Rev., 45* (*1917*), *No. 6, p. 301*).—Reviewing past records and original observations covering a vast extent of territory from Tanganyika southward and westward there is stated to be a considerable decrease in volume of the chain of great lakes and of the rivers feeding them in this region. The cause is not explained.

The modification of South African rainfall, J. M. Sim (*So. African Jour. Sci., 13* (*1917*), *No. 7, pp. 318–326*).—The author reviews evidence showing that rainfall has decreased throughout South Africa in the last hundred years, and that its character has changed from soft, soaking rains to torrential thunderstorms. As a result the water supply of a large portion of the region is entirely inadequate, while a further portion is threatened by a spread of desiccating conditions. Even in those regions where the rainfall can still be said to be sufficient desiccation is proceeding, which must ultimately result in arid or semiarid conditions.

A correlation between magnetic storms and rain, H. Arctowski (*Compt. Rend. Acad. Sci.* [*Paris*], *164* (*1917*), *No. 5, pp. 227–229; abs. in Sci. Abs., Sect. A—Phys., 20* (*1917*), *No. 236, p. 315*).—"Rainfall observations at Batavia and Greenwich are used to show an apparent relation between rainfall and magnetic storms, which suggests that the phenomena may be connected in some way, probably through the medium of solar activity."

Modern methods of protection against lightning, R. N. Covert (*U. S. Dept. Agr., Farmers' Bul. 842* (*1917*), *pp. 32, figs. 25*).—This publication gives practical information regarding protection of buildings against lightning, accompanied by specifications for installing the equipment.

Effect of meteorological factors on the germination capacity of seeds, J. N. Walldén (*Sveriges Utsädesför. Tidskr., 26* (*1916*), *No. 4, pp. 146–162, figs. 4; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 8* (*1917*), *No. 3, pp. 340–342*).—It is stated that the capacity of seeds to produce vigorous, rapidly-growing seedlings is affected to a marked extent by meteorological conditions at the time of the maturing of the seeds.

"Copious rain and a low temperature during the period of ripening and harvest stimulate the development of the grain, which subsequently germinates in storage or even in the shock. The degree of sensitiveness varies according to the species, but is maximum in rye, which two days' rain are sufficient to germinate. For wheat, barley, oats, marked differences are noted between different varieties."

Prematurely-sprouted seeds produce weak and malformed seedlings. Seeds matured during dry weather ripen more quickly and germinate better than those ripening during wet weather. "The rapidity with which the germinating point is reached is not only subject to the influence of the temperature during the period of ripening, but is also dependent upon the specific properties of the different varieties. . . . The time required for reaching the degree of ripeness requisite for germination is shorter in proportion as the seed is drier. It must be noted, however, that this point is not reached immediately after shrinking, which proves that the ripening process is not merely the mechanical result of loss of water, but depends upon biochemical changes occurring within the grain."

Influence of meteorological factors on the development and yield of the millets, Panicum miliaceum and Setaria italica, in Russia, M. G. Sirtusov (*Trudy Selsk. Khoz. Met., No. 16* (*1916*), *pp. 118–131, figs. 6; abs. in Internat.*

Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 3, pp. 342–346).—From the results of a study at the Temir experiment station in south Russia of the specific action of meteorological factors on the development of millet, the following conclusions are drawn:

"Germination only takes place when the mean soil temperature (24 hours) at the spot where the grains are situated is not below 10–12° C. • The higher the temperature the more rapid are germination and growth. . . . Thermal conditions have a clear influence on the flowering phase, which is more rapid the greater the daily rise and fall of temperature. . . .

"The rainfall values are spread over various periods of development. In this case six periods only are distinguished instead of eight; they are (1) sowing, (2) appearance of young plants, (3) development of the third leaf—stooling, (4) stooling—earing, (5) earing—flowering, (6) flowering—complete maturity. The critical period for millet with respect to rainfall coincides with the stooling phase, although it is not yet exactly known whether the notable need of water by the plant at this moment is to be correlated with the actual stooling process or with the development of the lateral rootlets. In the atmospheric layer where the millet develops its epigeal portions (stem and flowers) the plant itself takes special precautions, thanks to which the meteorological factors are modified and fixed as the result of quite special combinations and relationships. It creates a kind of 'microclimate'."

SOILS—FERTILIZERS.

Further studies on the freezing point lowering of soils, G. J. Bouyoucos and M. M. McCool (*Michigan Sta. Tech. Bul. 31 (1916), pp. 51, fig. 1*).—In continuation and extension of work previously reported (E. S. R., 34, p. 721), in which the freezing point lowering was measured in over 58 soils at very low and very high moisture contents, it was found that the original experimental data, general conclusions, and hypotheses were confirmed. The soils used included characteristic types from the States of Rhode Island, Pennsylvania, Michigan, Kentucky, Florida, Texas, Wisconsin, Minnesota, Washington, and California.

"The results obtained from this study show (1) that the lowering of the freezing point of soils is entirely different at the two moisture contents in all the different soils. (2) The degree of the freezing point lowering is quite small at the high moisture content and varies rather appreciably in the different soils, while at the low moisture content it is tremendously high and varies considerably in the various soils. At the maximum percentage of water the lowering of the freezing point varies from 0.01° C. in the case of some sands to 0.075° in the case of some clay loams and clays, while at the minimum percentage of moisture it ranges from about 0.11° in some sands to about 1.37° in some of the loams and clays. The degree of depression for heavy sandy loams, silts, clay loams, and clay tends to be above 1° at the minimum water content, while that of sands and very light sandy loam lies as a rule close to 0.4°. . . .

"It was found that the magnitude of the lowering of the freezing point of soils at the low moisture content decreases with successive freezings. This was true, however, with the agricultural soils, but not with artificial substances such as quartz sand, kaolin, burned soils, etc. For explaining these phenomena the hypothesis is offered that the greatest portion of the water which is made inactive or unavailable and thus removed from the field of action as far as the freezing point lowering is concerned, is due to the colloids which the soils contain. . . .

"By means of the freezing point method the effect of application of soluble salts and acids upon the concentration of the soil solution in the soil was also studied. The results pertaining to the soluble salts show that the different compounds employed have an entirely different effect upon the concentration of the solution of the diverse classes of soil. In the case of the neutral salts the solution of the agricultural soils was increased from 35 to 100 per cent of their added strength, while in the case of the phosphate salts only a very small portion of their concentration was added to the soil solution, amounting in the majority of cases to only 10 per cent. All the salts, including the phosphates, behaved the same in regard to the artificial substances, the quartz sand, kaolin, burned soils, etc., as they all increased the concentration of their solution to about the same degree, 100 per cent. The neutral salt solutions did not behave uniformly in the different types of soil, some of the salts produced the greatest increase in concentrations in the sands and the smallest in the clays, while other salts caused about the same degree of concentration in all the distinct types of soil.

"The different acids affected the concentration of the soil solution very differently. Some of the acids augmented the concentration of the solution of the agricultural soils from 50 to 70 per cent of their added strength, others about 130 per cent, and still others only about 5 per cent.

"The increase in concentration of the soil solution as produced by the application of the salts and acids is due to the formation of new substances, the depression of the freezing point of which is as great, greater, or less than that of the original substance. In the case of the artificial substances such as quartz sand, kaolin, burned soils, etc., both the original concentration and composition of the salt solutions remained practically unaltered."

Method of sterilizing and chloroforming soil used in studying chernozem, S. Skalskij (*Iuzh. Russ. Selsk. Khoz. Gaz., 1916, Nos. 1, pp. 7, 8; 2, pp. 6, 7; 5, pp. 5–7; 7–9, pp. 9, 10; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 7* (*1916*), *No. 9, pp. 1249–1253; Jour. Soc. Chem. Indus., 36* (*1917*), *No. 5, pp. 298, 299*).—Experiments are reported with fallow chernozem soil plowed in April, a chernozem soil cleared several years previously, and a three-year-old lucerne chernozem soil.

"From each of these a surface layer (0–17.7cm.) and a layer immediately below it (17.7–35.5 cm.) were taken, treated with various fertilizers, potted, and sown with sterilized oat seeds. The first series (a) served as controls, the second (b) was manured with potassium nitrate and magnesium sulphate and used to determine the assimilable phosphoric acid content, the third (c) received potassium dihydrogen phosphate and magnesium sulphate and was used to determine the assimilable nitrogen, the fourth (d) received a complete mineral dressing of potassium nitrate, potassium dihydrogen phosphate, and magnesium sulphate, the fifth (e) contained soil sterilized by heating in an autoclave in steam for one hour under 2.5 atmospheres, and in the sixth (f) chloroformed soil was employed. Four plants were grown in each pot and they were watered from below with rain water so that the moisture content remained at the optimum throughout.

"The plants died in some of the sterilized samples of soil. . . . The fertility of (d) and (e) was about the same and much superior to the rest. (f) came next, followed by (c), (b), and (a). To investigate the causes of the increased fertility, the bacterial flora in the fallow soil was examined. The bacterial numbers in (e) and (f) were incomparably greater than in (a), greater in the shallow than in the deep soil, and greater on agar than on gelatin. In (f), the bacterial increase and the higher fertility were accompanied by an enrich-

ment in nitrogen and phosphorus. The gain of assimilable nitrogen is ascribed to bacterial fixation of atmospheric nitrogen and to the decomposition of organic matter, that of the phosphorus to the action of soil organisms in liberating acids which attacked the phosphates, and in converting unavailable organic phosphorus into an assimilable state.

"The bacteria in the sterilized samples (e) were derived from the air, and the enhanced fertility was chiefly due to the increase in available phosphoric acid, which amounted to from 47 to 76.5 per cent in the lower layer and 88 to 121 per cent in the arable strata, and which is ascribed to the decomposition of nucleins containing 5.7 per cent of phosphorus which liberate free phosphoric acid when heated to 150° C. The nitrogen contents of the sterilized and unsterilized soils were the same, and as the good effects of sterilization could not be entirely due to the increase in soluble phosphoric acid they must also be accounted for by assuming that assimilable nitrogen is liberated from organic matter during sterilization. The increase of available nitrogen in series (e) was clearly indicated by the rich green color of the leaves of the young plants."

Formation of "black alkali" (sodium carbonate) in calcareous soils, J. F. Breazeale (*U. S. Dept. Agr., Jour. Agr. Research, 10 (1917), No. 11, pp. 541–590, pl. 1, figs. 26*).—Studies on the formation of sodium carbonate in calcareous soils are reported from which the following conclusions were drawn:

"In the reaction between sodium nitrate (or sodium chlorid or sodium sulphate) and calcium carbonate, resulting in the formation of sodium carbonate, the presence of relatively small amounts of calcium nitrate or calcium chlorid in the reaction impedes and may prevent the formation of sodium carbonate. The presence of a saturated solution of calcium sulphate in this reaction does not entirely stop the formation of sodium carbonate.

"Sodium nitrate, sodium chlorid, and sodium sulphate in the presence of carbon dioxid react with calcium carbonate with the formation of sodium bicarbonate. The presence of relatively small amounts of calcium nitrate or calcium chlorid in this reaction impedes and finally prevents the formation of sodium bicarbonate. The presence of calcium sulphate has no effect in preventing the formation of sodium bicarbonate when sodium sulphate or a mixture containing sodium sulphate reacts with calcium carbonate. A field application of gypsum will probably have no effect in overcoming black alkali if the soil already contains soluble sulphates in appreciable amounts, or the irrigation water contains these salts.

"Sodium nitrate, sodium chlorid, and sodium sulphate increase the solubility of calcium carbonate in the soil. Sodium nitrate, sodium chlorid, and sodium sulphate react with calcium carbonate in the soil with the formation of sodium carbonate (black alkali). Sodium carbonate, formed by the above reaction decomposes the organic matter of the soil. Calcium carbonate has a slightly destructive action upon the organic matter of the soil. Sodium carbonate is much more destructive upon organic matter than sodium bicarbonate.

"The alkali crusts that accumulate upon the soil in some irrigated regions are due in part to the action of sodium salts upon calcium carbonate with the formation of sodium carbonate. Barren, or 'slick,' spots are often due to the action of sodium nitrate, sodium chlorid, or sodium sulphate upon calcium carbonate with the formation of sodium carbonate. Sodium chlorid and sodium sulphate have a protective action upon organic matter in the presence of sodium carbonate. A calcareous hardpan often produces black alkali."

The soil survey of Iowa, W. H. Stevenson, P. E. Brown, and F. B. Howe (*Iowa Sta. Soil Survey Rpt. 1, Abs. (1917), pp. 3–16, fig. 1*).—This is an abstract of Soil Survey Report 1 of the station (E. S. R., 37, p. 211).

Characteristics of coli-like microorganisms from the soil, B. R. JOHNSON and M. LEVINE (*Jour. Bact.*, *2* (*1917*), *No. 4*, *pp. 379–401*, *figs. 2*).—Experiments conducted at Iowa State College are reported "to determine (1) if the methyl-red negative or Vosges-Proskauer positive organisms are the predominant coli-like forms in soil, and (2) to study the characteristics of the various types of aerobic lactose-fermenting organisms isolated from soils. Forty-two samples were studied, including 9 from different parts of a corn field and 1 from a clover field in Ames, Iowa, 13 from fallow, and 11 from cropped experimental plats, 4 from orchards, and 4 miscellaneous samples from different parts of the State."

It was found that under the conditions prevailing in Ames, Iowa, coli-like bacteria were considerably more abundant in soils upon which crops were growing than in absolutely fallow areas receiving similar soil treatment. The Vosges-Proskauer and methyl-red reactions were well correlated. The *ærogenes-cloacæ* types, which give a positive Vosges-Proskauer reaction and are alkaline to methyl-red in Clark and Lubs' peptone-di-potassium-phosphate-glucose solution, were the predominant coli-like forms in soil. "The *ærogenes-cloacæ* group may be differentiated from the coli group by the methyl-red of Vosges-Proskauer reaction. *Bacillus ærogenes* differs from *B. cloacæ* in that it is nonmotile, rarely liquefies gelatin, and forms gas from glycerol and corn starch."

General fertilizer experiments, C. F. NOLL (*Pennsylvania Sta. Rpt. 1915*, *pp. 57–59*).—Tabulated data are presented showing the yields of all crops on the general fertilizer plats for the years 1912 to 1914, inclusive, in continuation of work previously noted (E. S. R., 34, p. 128). See also Bulletin 146 (E. S. R., 37, p. 626).

Fermentation of manure treated with sulphur and sulphates: Changes in nitrogen and phosphorus content, J. W. AMES and T. E. RICHMOND (*Soil Sci.*, *4* (*1917*), *No. 1*, *pp. 79–89*).—Experiments conducted at the Ohio Experiment Station on the effects of sulphur, calcium sulphate, and acid phosphate upon the changes occurring in solid horse manure and upon the nitrogen content of cow urine are reported.

It was found that the loss of dry matter from manure after fermenting for 250 days was 32.5 per cent in untreated manure and 21.8 per cent from manures treated with acid phosphate and calcium sulphate, while the sulphur-treated manure lost 18 per cent. Manures treated with acid phosphates, sulphur, and calcium sulphate lost approximately 3.5 per cent of their total nitrogen, as compared with a loss of 10.5 per cent from the untreated manure. The water-soluble and nonprotein nitrogen were greatly reduced during fermentation. The water-soluble phosphorus decreased in all the samples, but at the same time the citrate-insoluble also decreased. The solubility of phosphorus in 0.2 hydrochloric acid increased, and the organic phosphorus was greatly decreased during fermentation. The three treated manures evolved large amounts of hydrogen sulphid. The largest amount was evolved from manure to which sulphur was added. The manure treated with flowers of sulphur produced water-soluble sulphates equivalent to 23.4 gm. of sulphuric acid, as compared with a loss of about 4 gm. from the untreated sample during fermentation. The acidity of water extracts of untreated and sulphur-treated manure was the same at the beginning of the experiment, but during fermentation the sulphur-treated manure increased in acidity while the untreated sample became alkaline.

Sulphur, calcium sulphate, and acid phosphate were very effective in preventing loss of nitrogen from urine. The untreated urine lost 80 per cent of its total nitrogen. Treatment with sulphur reduced the loss of nitrogen to 10 per cent and prevented formation of ammonium salts. The calcium-sulphate-

treated sample lost 9.7 per cent of its nitrogen, and 68 per cent of its total nitrogen was transformed to ammonium sulphate and held as such. The urine treated with acid phosphate lost only 5 per cent of its nitrogen, and the treatment prevented the formation of ammoniacal nitrogen in an open container during the 37-day period of the experiment. After standing in a closed jar three months longer, the acid-phosphate-treated urine was found to be alkaline and evolving ammonia.

Green manuring, C. Bernard (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Thee, No. 51 (1916), pp. 34, pls. 10*).—This is a review and summary of a number of experiments with different leguminous green manures, especially on tea soils of the Dutch East Indies.

Leguminous crops planted between the rows of tea and used as green manure were in general found to be beneficial, especially if the soil was in poor physical condition. Variable results were obtained with different legumes.

Soil acidity: The relation of green manures to its development, J. W. White (*Pennsylvania Sta. Rpt. 1915, pp. 60–86*).—This reports a study of the effect upon soil acidity of adding organic matter, including manure and fresh and air-dry leguminous and nonleguminous crops, to an acid silty loam soil obtained from plats to which ammonium sulphate had been applied for several years. The organic matter was finely ground, thoroughly mixed with the soil, and the mixture placed in jars and freely exposed to the air for a period of nine months, the optimum moisture conditions being maintained in the soil.

Tabulated data are presented and the results are discussed in detail with reference to changes in the lime requirement of the soil, and the effect of the organic manures upon nitrification; and upon the amount and condition of the humus of the soil under the different treatments.

It is concluded that "in general, these experiments have satisfactorily shown that fresh green manures plowed under on this acid silty loam soil reduce its acidity very soon after plowing under, but finally leave a soil of increased acidity; also that nitrification goes on in them quite vigorously under suitable moisture, temperature, and aerative conditions, and that the green manured soils are rich in nitrates, despite the soil acidity. As to the cause of the increased acidity, beyond showing that it is not largely due to nitrification and indicating that it is in some way associated with the added organic materials or their fermentative residues, the experiments furnished little definite information."

Continued studies in acid soil from the ammonium sulphate plats, J. W. White (*Pennsylvania Sta. Rpt. 1915, pp. 86–103, pls. 3*).—A detailed study of variations in lime requirements and nitric nitrogen content of soils from plats which had been fertilized with ammonium sulphate for several years, is reported in continuation of work previously noted (E. S. R., 35, p. 514). Additional studies of changes in lime requirements as a result of leaching with water, leaching with absolute alcohol and of storage; nitrification in acid soils on which ammonium sulphate, dried blood, and cottonseed meal were used alone and with limestone; and the relation of humus to lime requirements in various soils.

On one of the areas studied the lime requirement varied from neutral to the equivalent of 5,277 lbs. of calcium carbonate per acre within a distance of 3 ft. Corn failed where the lime requirement was greater than 5,000 lbs. of calcium carbonate per acre to a depth of 7 in. The variation in growth of clover and corn on this area was in close accord with the variation in the lime requirement. Corn also failed on a plat where the nitric nitrogen was equivalent to 8.74 parts per million. Fine dust removed from the surface of this plat showed

a lime requirement equivalent to 10,814 lbs. of calcium carbonate and nitric nitrogen equivalent to 21.46 parts per million. Three of the plats showed the existence of an acid subsoil to a depth of 3 ft. and nitric nitrogen was found at this depth on each of the plats. Leaching the acid soils with water and with alcohol did not decrease the lime requirement.

In soil treated with ammonium sulphate at the rate of 10 tons per acre, the nitric nitrogen remained fairly constant, but the lime requirement greatly increased. It is suggested that in this case ammonium sulphate remained as such in the soil and reacted with limewater as follows:

$$(NH_4)_2SO_4+Ca(OH)_2=CaSO_4+2NH_3+2H_2O$$

Soils stored in closed jars for two years showed no change in lime requirement.

Nitrification was observed in a soil having a lime requirement equivalent to 6,000 lbs. of calcium carbonate, under different treatments as follows: Without lime, check soil 15.78 parts per million, ammonium sulphate 11.5, dried blood 24.72, and cottonseed meal 23.23; and with lime, check soil 43.54, ammonium sulphate 64.4, dried blood 85.8, and cottonseed meal 66.01. When applied at rates supplying the same amount of nitrogen the following increased lime requirement was noted: Ammonium sulphate 2,008, dried blood 610, and cottonseed meal 305 lbs. calcium carbonate. These results confirm the field observation that nitrification is possible on a very acid soil.

In all the soils studied of which the lime requirement was greater than 3,600 lbs. calcium carbonate, more so-called "free" humus (soluble in 4 per cent ammonia) was recovered than "total." "The alkali-soluble humus in a soil of high lime requirement is largely in an uncombined state and represents a condition similar to that brought about by washing a soil with a dilute mineral acid whereby the combined basic material is removed. In a soil well supplied with basic material the humus is in a combination insoluble in dilute ammonia. About 25 per cent of the humus extracted with ammonia is precipitated with hydrochloric acid."

The influence of fineness of division of pulverized limestone on crop yield as well as the chemical and bacteriological factors in soil fertility, N. Kopeloff (*Soil Sci., 4 (1917), No. 1, pp. 19–69, figs. 3*).—Experiments conducted at Rutgers College are reported on the influence of fineness of division of pulverized limestone upon crop yields on Carrington silt loam, Wooster silt loam, Cumberland silt loam, Norfolk sandy loam, Sierra sandy loam, and Portsmouth acid muck.

It was found that "an increase in fineness of division of pulverized limestone from 20 to 40, 60 to 80, 100 to 200, to finer than 200-mesh is responsible for a proportional increase in the yield and total nitrogen content of crimson clover . . . and a corresponding decrease in lime requirement. From the above standpoint there was little choice between burnt lime and 200-mesh limestone.

"Employing an apparatus devised for measuring the rate of neutralization of soil acidity by different grades of pulverized limestone, it was found that in three different soils the limestone finer than 60-mesh required about three weeks, while 20-mesh limestone required more than seven weeks to effect neutralization. An increase in the quantity of limestone required for neutralization was proportional to an increase in fineness of division of pulverized limestone for any given period of time. An increase in fineness of division of pulverized limestone is responsible for an increase in the activity of the bacteriological processes of ammonification, nitrification, and nitrogen fixation (within certain limitations) as measured in soil and solution. This holds true regardless of whether the amount of limestone applied is less or somewhat more than the

indicated Veitch lime requirement. The increase in bacteriological activities with an increase in fineness of division of pulverized limestone may be correlated directly with the chemical factors involved, i. e., the rate of neutralization of acidity, etc., and also crop yield."

With pots cropped to barley, buckwheat, and rape (twice) which had been designed to permit the collection of drainage water, it was found that on a light open sandy loam the highest yields were obtained from soils treated with 60 to 80 mesh limestone. Two-hundred-mesh limestone proved superior to 20-mesh, but inferior to 60 to 80 mesh because the fine material was probably washed down below the root zone. "These results were paralleled both in the series with and without nitrogen, although the yields in the former case were superior to those in the latter. However, the fine limestone without nitrogen gave almost as high a yield in several instances as the coarse material with an application of 660 lbs. of ammonium sulphate to the acre. The highest average percentage of nitrogen, however, was obtained with 200-mesh limestone.

"An increase in the fineness of division of pulverized limestone was accompanied by a reduction in the lime requirement. An analysis of the drainage waters indicated that there was a decreased loss of ammonia and nitrate nitrogen but an increased loss of calcium. In general, an increase in the fineness of division of pulverized limestone is responsible for a proportional increase in crop yield, as well as for exerting a beneficial influence on the chemical factors in the soil. Furthermore, 200-mesh limestone may be regarded as effective as burnt lime."

Limestone resources of Pennsylvania, W. Frear and F. J. Holben (*Pennsylvania Sta. Rpt. 1915, pp. 366–406*).—Additional analyses of Pennsylvania limestones and limestone products, supplementing a previous compilation (E. S. R., 34, p. 133), are given.

Manufacturing wastes as sources of farm lime, G. C. Given (*Pennsylvania Sta. Rpt. 1915, pp. 406–412*).—This reports the results of analyses of waste products from the manufacture of magnesia, acetylene, paper, leather, glue, and acetone, to determine their value as a source of lime for agricultural purposes. A brief description of the industrial process giving rise to each product is included.

Effect of three annual applications of boron on wheat, F. C. Cook and J. B. Wilson (*U. S. Dept. Agr., Jour. Agr. Research, 10 (1917), No. 12, pp. 591–597*).—Experiments conducted at the Arlington (Va.) farm of the Bureau of Plant Industry are reported, in which manure plus borax and manure plus colemanite were added at the rate of 20 tons per acre to plats growing wheat. Borax was mixed with manure the first year (1914) at the rate of 0.33 lb. per bushel, and the last two years (1915 and 1916), at the rate of 0.08 lb. per bushel. Colemanite was added to manure at the rate of 0.095 lb. per bushel. Analyses of the wheat straw, grain, and soil are included.

It was found that "borax reduced the yield of wheat (grain) 10 per cent in 1914 and 1915, while colemanite had little, if any, effect. The manured control gave the largest yields of grain in 1914 and 1915, and the unmanured controls the lowest yields. In 1916 the yields from all plats were low, and the proportion of straw to grain was higher than during the two previous years. In 1916 the borax plat gave the best yield.

During the three years there were seasonable variations involving a gradual decrease of fat and an increase of nitrogen in the grain and straw from all plats. During this period the moisture in the straw increased and that of the grain decreased.

"More boron was absorbed by the plants from the borax than from the colemanite plats. although only minute amounts of boron were absorbed by any of the wheat plants. The 1916 samples of straw and grain contained more boron than the 1914 and 1915 samples. In all samples a relatively uniform distribution of boron in the straw and grain was found.

"A yellowing of the young plants was observed the first year (1914) on the borax plat. This directly followed a heavy application of borax manure to the plat, and the sample of soil from this plat taken nine months later showed the presence of soluble boron. In no other soil sample was any soluble boron found. Apparently the added borax is gradually combined in an insoluble compound and so distributed that the upper 6 in. of soil show little total boron after three yearly additions of borax. There were no evidences of any cumulative action of boron in the soil. It was apparently the soluble boron, not the total boron, in the soil that produced injury to the wheat plants."

Domestic manures and related substances, W. THOMAS (*Pennsylvania Sta. Rpt. 1915, pp. 413–425*).—Analyses of cow and horse manure, and composts therefrom; sheep and goat manures; spent manures from mushroom beds; hen, duck, and pigeon manures, and composts therefrom; bat guano; and night soil are reported and discussed.

AGRICULTURAL BOTANY.

Plant succession on abandoned roads in eastern Colorado, H. L. SHANTZ (*Jour. Ecology, 5 (1917), No. 1, pp. 19–42, pl. 1, figs. 22*).—The author has made a study of some roads on the high plains in eastern Colorado and various phases of their formation, but more particularly of their obliteration, in an attempt to determine the relations of the vegetation to the factors affecting its prevalence, persistence, suppression, reestablishment, and development.

The natural vegetation at Akron, Colo., formerly discussed by the author (E. S. R., 24, p. 722) as the grama-buffalo grass association of the short-grass formation, the principal type of the central portion of the Great Plains, consists largely of grama grass (*Bouteloua gracilis* [*B. oligostachya*]) and buffalo grass (*Buchloë* [*Bulbilis*] *dactyloides*). It is said that an area if abandoned after cultivation will reestablish this association in from 20 to 50 years. The stages passed through in attaining this final result are described and summarized. An early weed stage of plants which are comparatively large but so scattered as not to compete for soil moisture is followed by a late weed stage, a dense growth of stunted plants, the total growth utilizing to the limit the available water. Next comes a temporary grass stage usually characterized by Schedonnardus, a short-lived perennial able to shut out the annuals by its power of quick appropriation of the surface water supply. Gutierrezia, utilizing the moisture of the deeper soil layers, gradually replaces Schedonnardus and is in turn replaced by the long-lived surface feeding Buchloë. Bouteloua reseeds very slowly and requires a number of years to attain the dominance somewhat quickly attained by Buchloë.

Cold resistance in spineless cacti, J. C. T. UPHOF (*Arizona Sta. Bul. 79 (1916), pp. 115–144, pls. 2, figs. 11*).—After a brief discussion of cold resistance in spineless cacti by J. J. Thornber, the author gives an account of field and laboratory studies on the relation between the morphology and physiology of a number of introduced and indigenous species of spineless cacti and their resistance to cold.

It was found that the species of spineless cacti having relatively thick integuments (this term including the cuticle, epidermis, crystal-bearing layer, and several layers of thick-walled cells lying immediately below) are more resistant to cold than those having somewhat thinner integuments. The thick integument was found to protect the cactus plant against sudden and severe temperature changes at any season. The freezing point of the cell sap of the cactus plant was found very little below that of pure water. The collecting and freezing of water in the intercellular spaces of the plants was not in itself particularly harmful to the plant, nor was the protoplasm poisoned by the concentration of the cell sap resulting from the withdrawal of part of the water from the cells by freezing. A study is reported to show that the protoplasm of these plants can withstand a certain low critical temperature without injury, but a temperature below this will destroy them.

The author found that *Opuntia castillæ* and *O. ellisiana* are resistant to lower temperatures than any of the other species studied, being injured at temperatures of —14 and —16° C. (6.8 and 3.2° F.), but *O. ficus indica* and Burbank Special are injured by temperatures of —5 and —6° C. These results, which were obtained in the laboratory, agree in general with observations on the same species under field conditions. A temperature which damaged the plants to any extent was found to kill them if continued long enough or if repeated several times. Differences in the character of the protoplasm, due allowance being made for the thickness of the integument when the cold extends over a short period of time, are believed to explain why one species of cactus is more resistant to cold than another.

Some studies on the germination of the seed of Oryza sativa, I. Nagai (*Jour. Col. Agr. Imp. Univ. Tokyo, 3 (1916), No. 3, pp. 109–158, pl. 1, figs. 2*).— Experimental results are reported in an attempt to verify and supply further data on the physiology of germination in the seeds of the Gramineæ. The experiments were conducted with the seed of *O. sativa* and *Zea mays* and the problem studied under the following subject heads: (1) The rôle of the selective-permeable septum of the seed covering in the viability of the seed, (2) the seat of the selective-permeable septum in the seed covering, (3) the rôle of oxygen in germination, (4) the effect of H and OH ions in germination, and (5) the influence of extremes of temperature on the germinative powers. All experimental data are presented in tabular form and briefly discussed. The general conclusions arrived at by the author follow:

In the seed covering of *O. sativa* and *Z. mays* selective permeability was observed. The seat of the selective-permeable septum in Oryza is most probably confined to the cutinized inner wall of the inner integument which lies directly above the aleurone layer in the fully matured grain.

The germinability of desiccated hulled Oryza was slightly affected by 24 hours' steeping in six-normal sulphuric acid, chloroform, acetone, ethyl ether, commercial absolute ethyl alcohol, picric acid (aqueous solution); and ethyl alcoholic (commercial absolute) solution of thymol, naphthalene, and α-naphthol, whereas the air-dried grains were killed by similar treatment. In the same manner the air-dried seed of Zea were killed by five-normal sulphuric acid, hydrochloric acid (21 hours), commercial absolute ethyl alcohol, ethyl alcoholic (commercial absolute) solution of naphthalene, resorcin, α-naphthol, and α-naphthylamine, but not the desiccated grain. The vitality of desiccated hulled grains of Oryza and Zea is lost by 24 hours' steeping in formaldehyde, formic acid, commercial absolute methyl alcohol, methyl ether, acetaldehyde, glacial acetic acid, butyric acid, amyl alcohol, pyridin, aqueous solution of chloral-hydrate, resorcin hydroquinone, and 21 hours' steeping in nitric acid (three-

normal, six-normal). The embryonal halves of desiccated hulled Oryza were capable of germination after 24 hours' steeping in commercial absolute ethyl alcohol, ethyl ether, ethyl alcoholic (commercial absolute) solution of resorcin, acetic acid, hydroquinone, and naphthalene, while the entire air-dried hulled grains were killed by similar treatments. Twenty-four hours' steeping in the aqueous solution of phenol, resorcin, α-naphthol, hydroquinone, acetic acid, and mercuric chlorid was fatal to both desiccated and air-dried Oryza (hulled) and Zea, whereas the corresponding alcoholic (commercial absolute) or ether solutions were harmful only to a considerable extent.

Hulled grain of Oryza can be germinated at an extremely low oxygen pressure, but under such conditions the development of the radicle is totally prohibited. A supply of oxygen initiates the development of the radicle in seedlings thus germinated. No appreciable stimulation was observed in the germination of Oryza from the influence of H and OH ions.

The germinability of Oryza, Zea, and Fagopyrum was practically unaffected by a few hours' exposure to the extremely low temperatures of liquid air, but two hours' exposure at 97 to 98° C. completely destroyed the vitality of Zea, while that of Oryza, especially of the desiccated seed, was only slightly affected.

An extensive bibliography is appended.

Permeability of certain plant membranes to water, F. E. Denny (*Bot. Gaz., 63* (*1917*), *No. 5, pp. 373–397, figs. 2*).—In the course of a study involving quantitative measurements of the permeability of certain nonliving plant membranes under controlled conditions and employing apparatus and methods for which delicacy, exactness, and constancy of osmotic pressure are claimed, the author found that in the seed coat of *Arachis hypogæa* the temperature coefficient of permeability to water is lower than that required by the van't Hoff law but higher than the diffusion coefficient. No evidence appeared that either chemical or physical processes are exclusively involved in the passage of water through the membrane. The temperature coefficient showed higher values at lower temperatures and lower values at higher temperatures, this being in agreement with the behavior of temperature coefficients in other processes. Comparison is made with the results obtained in other experiments by several other investigators named.

No hysteresis or after effect of a previous temperature was observed. Water passed more rapidly from the external toward the internal portion of the seed than in the opposite direction in the case of both peanut and almond. With distilled water on one side of the membrane, a sodium chlorid (but not a sugar) solution produced a rate of movement proportional to the osmotic pressure. Complex relations were observed when solutions of varying concentrations were opposed, and in general equal osmotic differences did not necessarily produce equal rates of movement, nor was any mathematical relation observed between the concentrations on opposite sides and water movement. The bearing of these facts is discussed. Considerable differences appeared in a comparison of the permeability of several plant membranes made under similar conditions.

Does the temperature coefficient of permeability indicate that it is chemical in nature? W. J. V. Osterhout (*Bot. Gaz., 63* (*1917*), *No. 4, pp. 317–320*).—The author, referring to the claim made by Stiles and Jörgensen (E. S. R., 35, p. 224) that the absorption of hydrogen ions by tissues of the potato has the temperature coefficient of a chemical reaction, cites experiments with disks of Laminaria packed in a roll through which a current was passed in which the temperature coefficient obtained was 1.33 while living, but dropped to 1.26, practically that of sea water, after the tissue had been killed.

The author considers the conclusion that permeability is chemical in its nature to require for its establishment more evidence than is at present available.

A method for producing conductivity water suitable for water culture experiments, R. B. HARVEY (*Bot. Gaz., 63 (1917), No. 4, pp. 321, 322, fig. 1*).—The author describes an apparatus which he has devised, tested, and used with success for the distillation of water free from the presence of metals, in sufficiently large quantity for water culture experiments. The apparatus is said to require but little attention beyond occasional cleaning and to produce a constant stream of high resistance water containing only such materials as may be taken up from glass of low solubility.

Saccharose in beets: Its formation and distribution, H. COLIN (*Rev. Gén. Bot., 28 (1916), Nos. 334, pp. 289–299; 335, pp. 321–328; 336, pp. 368–380; 29 (1917), Nos. 337, pp. 21–32; 338, pp. 56–64; 339, pp. 89–96; 340, pp. 113–127*).—Summarizing this extensive account of recent work and reviewing some previously reported (E. S. R., 33, p. 235; 34, p. 524), along with the findings and views of other workers, the author states that during the first year the leaf of the sugar beet always contains a mixture of saccharose with glucose and levulose, the latter of these two always predominating in the blade, the former in the petiole, especially near its base. Saccharose appears quickly in the leaf cells when exposed to light. It disappears in darkness after changing to invert sugar under the influence of sucrase, which always abounds in the leaf blade. The ratio of saccharose to reducing sugar decreases steadily from blade to crown, so that in the vicinity of the root there is an excess of reducing sugar, particularly glucose. Reducing sugar is always present, being more abundant in the root, but the proportion differs somewhat with the varieties tested.

During the second year of growth the sugar may under certain circumstances, as in darkness, again pass into the aerial portions, for example, migrating into the young stem as it becomes organized. Saccharose does not hydrolyze in the stem. Reducing sugar remains sensibly constant in the tissues so long as these remain intact. Saccharose leaves its place of storage in the roots as such and passes upward, generally becoming inverted on contact with the cells of the root, petioles, and leaf blades, the ratio of saccharose to reducing sugar decreasing from the root to the top of the inflorescence.

It is stated that the beet appears to be especially adapted to northern climates, giving in Prussia and Holland a higher sugar content than in Italy or Hungary.

The differences between the kinds designated respectively as sugar beets and forage beets, though considerable, are difficult to define precisely. The phenomena of elaboration and accumulation of sugar appear to be essentially the same in both these kinds of beet.

The author states that the roots as well as the leaves possess individuality, leaves of some very different varieties giving sensibly the same quantities of reducing sugar and of saccharose.

Humification of compounds entering into the composition of plants, A. G. TRUSOV (*Selsk. Khoz. i Liesov., 249 (1915), Nov., pp. 379–394*).—Experiments on the humification of lignin, cellulose, nuclein, glucose, starch, and tannin are reported.

It was found that with average humidity and a temperature of from 17 to 22° C., cellulose, hemicellulose, saccharose, glucose, levulose, gum, lignin, olive oil, glycerin, organic acids, and probably starch are not transformed into humus substances singly or in combination. On the other hand, albumin and tannin are transformed into humus when decomposing separately and in combination

with each other and with other plant constituents. The presence of calcium carbonate did not interfere with the humification of albumin and tannin. The colorimetric method was found to be satisfactory for the determination of humus.

Humification of compounds entering into the composition of plants, A. G. TRUSOV (*Selsk. Khoz. i Liesov., 252 (1916), Sept.–Oct., pp. 5–15*).—Continuing the above work, studies of the changes occurring in the composition of the organic parts of decomposing birch leaves are reported.

It was found that humus formation took place during the first brief period of decomposition and that the humus consisted mainly of the surface parts. Decomposition proceeded rapidly during the first 25 days, after which it proceeded more slowly. The decrease of organic substances during the first brief period of decomposition took place at the expense of the mineralization substances soluble in ether and alcohol. A certain decrease in the content of fats and pentosans was noticed during decomposition, although no increase in volume of humus resulted.

It is concluded that the greater part of tannic substances contained in plant residues decomposes very rapidly in from 8 to 12 days, this resulting in a proportionate increase in water-soluble humus formation.

Nitrogen-assimilating organisms in manure, H. L. FULMER and E. B. FRED (*Jour. Bact., 2 (1917), No. 4, pp. 423–434*).—Studies at the University of Wisconsin on the nature of the organisms concerned with the fixation of nitrogen in manures are reported.

It was found that there are several groups of bacteria concerned with nitrogen assimilation in manure. *Bacterium azophile* n. sp., which occurs abundantly in fermenting manures, seemed to be the chief organism responsible for the increase of nitrogen. The increase in nitrogen when the organism was grown in a manure-extract medium amounted to from 3 to 5 mg. per 100 cc. of solution. Twenty-eight degrees C. seemed to be a favorable temperature for the growth of the nitrogen-assimilating organisms of manure.

The relation of green manures to nitrogen fixation, H. L. FULMER (*Soil Sci., 4 (1917), No. 1, pp. 1–17, figs. 4*).—Investigations at the Wisconsin Experiment Station on the relation of green plant tissue to free-nitrogen-fixing organisms in silt loam field soil and garden soil are reported.

It was found that green manures, as clover, wheat, or oats, when added to soil favored free nitrogen fixation. "A gain in nitrogen was noted in both soils. The increase was highest with field soil, due perhaps to a greater number of nitrogen-fixing organisms. A gain in nitrogen was observed (1) where green tissue was applied to soil previously treated with a small amount of mannite, (2) where treated soil was used to inoculate Ashby's solution, and (3) when a pure culture of Azotobacter was used to inoculate a sterile solution containing green tissue. The nonlegume tissue stimulated fixation more than the legume, probably because of the nature of its carbohydrate content.

"The results of these experiments in their entirety show that nitrogen fixation results from the addition of green manures to soil. . . . The plants giving best results are the ones lowest in nitrogen content."

Peculiar effects of barium, strontium, and cerium on Spirogyra, S. S. CHIEN (*Bot. Gaz., 63 (1917), No. 5, pp. 406–409, figs. 2*).—Following up the investigations reported by Osterhout (E. S. R., 37, p. 130), the author has studied a large form of the *S. crassa* type, also a smaller species, in connection with several salts.

It was found that the cell chloroplasts of the larger species contract away from the cell wall in a characteristic way in solutions of cerium trichlorid, barium chlorid, and strontium chlorid, those of the smaller kind in the last two

only. The effect may be observed in the larger species in concentrations as low as 0.00005 molecular. In the smaller species the effect of barium chlorid is inhibited by the presence of cerium trichlorid or cerium bichlorid in certain proportions.

Certain effects under irrigation of copper compounds upon crops, R. H. FORBES (*Arizona Sta. Bul. 80 (1916), pp. 145–238, pls. 4, figs. 16*).—This work, which was carried on cooperatively between the Arizona Experiment Station and other institutions, has already been noted from another source (E. S. R., 37, p. 527).

Injury caused to vegetation in grounds near ironworks at Terni, Italy, G. AMPOLA and A. VIVENZA (*Ann. R. Staz. Chim. Agr. Sper. Roma, 2. ser., 8 (1916), pp. 139–164; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 5, pp. 746, 747*).—In continuation of work previously noted (E. S. R., 30, p. 432), the authors state that on land thickly planted with trees, bushes, and vines and so situated as to receive the smoke and gaseous products from several chimneys progressive injury was done the plants. Grapevines were found to suffer most seriously, showing a general decline of vegetative power, also a scorching effect on the leaves. Such plants as fig, apricot, peach, and certain nuts are injured seriously; pear, apple, cherry, elm, and olive somewhat less; and willow, poplar, oak, and hazel, also grasses and other plants, little or not at all. The sulphurous anhydrid contained in the air over the grounds ranged from 0.00034 to 0.00048 gm. per cubic foot.

It is supposed that within a few years the vines and apricots will die out completely on the property investigated, and that the figs and peaches will in large part disappear.

Some inter- and back-crosses of F_1 Œnothera hybrids, B. M. DAVIS (*Genetics, 2 (1917), No. 2, pp. 155–185, figs. 6*).—The present contribution describes the outcome of crosses made between several species of Œnothera, though these results are conceded to be incomplete owing to the fact that the work was done before methods had been developed to obtain a complete germination of Œnothera seed, as published by the author (E. S. R., 34, p. 135) and by De Vries (E. S. R., 35, p. 332). Other work by both of these authors is referred to and discussed.

Among the results noted, it is stated that experimental germination tests in Petri dishes showed some remarkably high sterility figures in the results of crosses between *Œ. biennis* and *Œ. muricata*. Some new types are added to the hybrids known to result from this crossing. Crosses between *Œ. biennis* and *Œ. franciscana* showed a much greater variety of forms with much less seed sterility than did those between *Œ. biennis* and *Œ. muricata*, and this range of forms is interpreted as segregation. The results for double reciprocals from F_1 hybrids of *Œ. biennis* and *Œ. grandiflora* also indicated a segregation of factors.

The presence of a class of dwarfs was noted in all of these cultures. Data involving *Œ. muricata* and *Œ. gigas* show situations presenting problems of sterility. Remarkable linkages or correlations were recorded, especially in crosses of *Œ. biennis* and *Œ. franciscana*.

A correlation between endosperm color and albinism in maize, J. H. KEMPTON (*Jour. Wash. Acad. Sci., 7 (1917), No. 6, pp. 146–149*).—While growing seedlings from an ear of maize which had been obtained from a self-fertilized first generation plant resulting from a cross between *Zea tunicata* and *Z. ramosa*, as described by Collins (E. S. R., 37, p. 536) and having both yellow and white grains in the ratio approximately of 3:1, the author found what is thought to be a correlation (probably in the nature of a coherence) between endosperm color in the seed and chlorophyll development in the seedlings. Several degrees

of albinism appear, the plants grading almost imperceptibly from white into yellow.

The progeny of a self-fertilized ear from a sister plant of the male parent of the cross between *Z. ramosa* and *Z. tunicata* was observed in 1916 to have produced many albino plants. The yellow endosperm is thought to have come from the *Z. ramosa* parent, no albino seedlings having yet been found in the strain. It is considered as possible, however, that the apparent coherence is really a physiological correlation between white or albino endosperm and albino seedlings.

Observations on the inheritance of anthocyan pigment in paddy varieties, G. P. HECTOR (*Mem. Dept. Agr. India, Bot. Ser., 8 (1916), No. 2, pp. 89–101, pls. 2*).—Recording and discussing observations made at Dacca on the inheritance of reddish and purplish anthocyan pigment in various portions of the plant, which were made in the course of more directly practical work, the author states that the colors in the leaf sheath, glume apex, and stigma of certain varieties of rice appear to be due generally to the interaction of several factors, the color present in the stigma in certain cases appearing to be associated with the presence of an extra factor which is missing from the other portions named. In cases in which the color is due to the interaction of factors, the presence of all color factors appears to be necessary for the production of any color.

Further studies on the relationship between bilateral asymmetry and fertility and fecundity in the unilocular fruit, J. A. HARRIS (*Genetics, 2 (1917), No. 2, pp. 186–204, figs. 3*).—The author has previously (E. S. R., 36, p. 221) outlined attempts made to solve certain correlation problems regarding morphological and physiological characters of plants. He here summarizes the whole of the available data bearing upon the 16 series herein reported and analyzed as resulting from a study of fertility in pods of the garden bean. This was a study of bilateral asymmetry as related to the number of ovules produced on the two carpellary margins and the capacity for seed production of the unilocular fruit.

The constants from the data are considered to justify the conclusion that there is a negative relationship between bilateral asymmetry and the capacity of the pod for maturing its ovules into seeds.

On the applicability of Pearson's biserial r to the problem of asymmetry and fertility in the unilocular fruit, J. A. HARRIS (*Genetics, 2 (1917), No. 2, pp. 205–212, fig. 1*).—This paper is intended to illustrate the applicability of the method presented by Pearson (E. S. R., 22, p. 671) for measuring the intensity of relationship between an alternative and a quantitatively measured variable to the problem of the relationship between bilateral asymmetry and capacity for seed production in the unilocular fruit, as a contribution to the further analysis of the matter above noted.

The constant of correlation proves to be a very low order.

Supplementary determinations of the relationship between the number of ovules per pod and fertility in Phaseolus, J. A. HARRIS (*Genetics, 2 (1917), No. 3, pp. 282–290, figs. 2*).—The data upon which the present discussion is based are those of the paper above noted, and the method of determining correlation is the one usually employed. The study of the several series of data for Phaseolus here presented is considered to justify the conclusion that there is here a negative relationship between the number of ovules per pod and the capacity for maturing these ovules into seed.

FIELD CROPS.

[Work with field crops at the Belle Fourche reclamation project experiment farm in 1916], B. Aune (*U. S. Dept. Agr., Bur. Plant Indus., Work Belle Fourche Expt. Farm, 1916, pp. 1–6, 10, 11, 12–16, 19–26, figs. 2*).—Continuing work previously noted (E. S. R., 36, p. 131), the results of experiments with pasture mixtures, rotation tests with irrigated field crops, fall irrigation experiments for annual crops (E. S. R., 37, p. 822), and variety tests with small grains, corn, potatoes, and root crops are reported for 1916. Climatic conditions on the project for 1916 are reviewed and meteorological observations from 1908 to 1916, inclusive, summarized. Additional data show the acreage, yields, and farm values of crops produced on the project in 1916 and of the principal crops grown from 1913 to 1916, inclusive.

Four grass, clover, and alfalfa mixtures seeded in 1915 were clipped at intervals of 10, 20, and 40 days to determine what frequency of clipping would give the maximum production. Clippings made every 10 or 20 days gave no appreciable difference in yields, but those made every 40 days increased the forage yield 50 per cent or more. White clover appeared to stand frequent clipping much better than alsike clover. Alfalfa produced slightly more forage in the spring than brome-grass, two and a half times as much in midsummer, and three times as much in the autumn. Brome-grass, slender wheat-grass, and alfalfa are reported as being distinctly superior in quantity of forage produced in 1916. White and alsike clovers, alfalfa, tall fescue, meadow fescue, redtop, and Kentucky blue-grass appeared to make the best growth during midsummer, while white clover, alfalfa, tall fescue, redtop, and Kentucky blue-grass made superior fall growth. Timothy made poor growth throughout the entire season.

The average yields of crops grown in the irrigated rotation experiments in 1916 amounted to 3.42 tons for alfalfa, 7.03 tons for sugar beets, 39.5 bu. for corn, 10 bu. for spring wheat, 11.9 bu. for winter wheat, 54.7 bu. for oats, 24.4 bu. for barley, 7.07 bu. for flax, 153.8 bu. for potatoes, 0.66 ton for clover, and 2.08 bu. for clover seed. All the small grain yields were affected by unfavorable climatic conditions. Practically no winterkilling occurred with alfalfa seeded in oat stubble before the last of August.

Small-grain varietal tests were seriously affected in 1916 by unfavorable weather conditions and by injury from rust. In tests with winter grain, wheat outyielded rye, while the yields of emmer and spelt were less than those of either wheat or rye and, due to their low feeding value, they are deemed unsuited to this region. Turkey selection and Kharkof winter wheats, with 2-year average yields of 39 and 38.8 bu. per acre, respectively, were first in the variety tests. Swedish (Minn. No. 2) rye yielded 27.7 bu. per acre and North Dakota No. 959, 25.2 bu.

In variety tests with spring wheats, Kubanka gave consistently high yields, resulting in an average of 21 bu. per acre for the period of 1913 to 1916, inclusive. Marquis was second with 16 bu. per acre.

Oat variety tests are reported for the period of 1912 to 1916, inclusive, with White Russian highest with an average yield of 43.7 bu. per acre. Swedish Select was second with 38.6 bu. and Canadian third with 36.5 bu.

Chevalier and Chevalier II barleys, 2-rowed hulled types with 3-year average yields of 29 and 28.7 bu. per acre, respectively, were the highest-yielding barley varieties tested. Himalaya (Guy Mayle, awned) was highest of the 6-rowed naked types with 22.5 bu., while the average yield of Manchuria (Wis. No. 13), a 6-rowed hulled type, was 19.1 bu. White Spring emmer, grown for comparison with barley, yielded 42.5 bu. per acre, or 1,360 lbs. of grain, as compared with a yield of 1,393 lbs. of grain from Chevalier barley.

In flax variety tests, Russian (N. Dak. No. 155) has given the highest average yield for the period of 1912 to 1916, inclusive, 10.9 bu. per acre. Primost (Minn. No. 25) and North Dakota Resistant No. 52 gave average yields of 9.9 and 9.3 bu. per acre, respectively. Select Russian (N. Dak. No. 1215), with a yield of 10.7 bu. for 1916 and an average yield of 12.3 bu. for 1914–1916, inclusive, is regarded as about equal to Russian (N. Dak. No. 155).

From corn variety tests reported for 1916 and for the period of 1913–1916, inclusive, it is concluded that Northwestern Dent, Payne White Dent, and Gehu Flint are best adapted to this region. Gehu Flint yielded 46.6 bu., Northwestern Dent 42.2 bu., and Payne White Dent 43.8 bu. per acre in 1916.

Potato variety tests are reported for the period of 1914–1916, inclusive. The highest average yield, 133.1 bu., was secured from Selection 4452, developed from Professor Maerker and Silver Skin. Peerless was second, with a yield of 122.7 bu. per acre, and Olds Prolific and Burbank third and fourth, respectively, with average yields of 112.8 and 111.6 bu. per acre.

Tests with root crops in 1916 included half sugar stock beets, Golden Tankard stock beets, Mammoth Long Red stock beets, and stock carrots, and resulted in yields amounting to 29.76, 24.63, 23.75, and 10.45 tons per acre, respectively.

[Field crops studies at] substation No. 1, Beeville, Texas, 1910–1914, E. E. Binford (*Texas Sta. Bul. 214* (*1917*), *pp. 3–19, 19, 20, 26, 27, fig. 1*).—Variety and cultural tests with cotton, corn, oats for hay, legumes, grain sorghums, Sudan grass, and miscellaneous forage crops conducted at the Beeville substation from 1910–1914, inclusive, are reported. Climatological data for the period are noted and briefly discussed.

The highest average yield of seed cotton per acre secured in variety tests in 1912 and 1914 was 964.84 lbs. from Mebane, with King second with 951.1 lbs., Rowden, Crowder, and Lone Star, with average yields of 923.13, 921.29, and 708.04 lbs. per acre, respectively, are also deemed well-suited to local conditions. A comparison of frequent and infrequent cultivation of cotton gave 2-year average yields of 684.4 and 681.7 lbs. of seed cotton per acre, respectively.

In corn variety tests, Thomas, with a yield of 25.44 bu., and Surcropper, with 24.04 bu. per acre, gave the highest average yields for tests conducted in 1913 and 1914. Relative yields of corn from 120 different ears of the same variety varied from 17.57 to 48.86 bu. per acre. The data reported show that neither the weight nor the size of the ear are an indication of its yielding power.

Rate-of-seeding tests with corn were conducted during 1913, an extremely dry season, and 1914. The seeding rates varied from 2,420 to 9,680 stalks per acre. The highest yield in 1913 was secured from the thinnest seeding rate and amounted to 10.9 bu. per acre. The 1914 results showed a gradual increase in yield up to a seeding rate of 4,840 stalks per acre, when a yield of 37.08 bu. was obtained, although the maximum yield, 39.92 bu., occurred with a seeding rate of 7,260 stalks per acre. Tests were conducted in 1913 and 1914 with corn planted (1) in rows 3 ft. apart with the stalks 3 ft. apart in the row, (2) in rows 6 ft. apart with the stalks 18 in. apart in the row, and (3) in 3-ft. rows in pairs 9 ft. apart with the stalks 18 in. apart in the row. Each plat was left with 4,840 stalks. The average yields for the different planting methods amounted to 23.4, 21.87, and 20.64 bu. per acre, respectively. The results are held to indicate that the distribution of the corn stalks on the land is relatively unimportant, although the wider planting distances facilitated clean cultivation. These experiments are to be continued.

Corn sown to cowpeas in 1913 after the corn had approached maturity showed no reduction in yield when compared with corn grown alone. Cowpeas sown in corn during the early period of growth in 1912 apparently caused a reduction in the yield of corn of nearly 50 per cent.

In variety tests with oats for hay in 1912, Texas Red Rust Proof, Hundred Bushel, Appler, and Tennessee Turf gave yields of 9,550, 8,830, 8,430, and 6,130 lbs. per acre, respectively. Further tests with Texas Red Rust Proof in rotation for hay gave yields of 4,960 and 2,220 lbs. per acre for 1913 and 1914, respectively.

Cowpea rate-of-seeding tests conducted in 1913 and 1914 gave average yields of cured hay of 2,375, 2,316, and 2,866 lbs. per acre, respectively, for 30-, 60-, and 80-lb. rates sown broadcast.

The average yields secured in tests with 6 varieties of peanuts for 1912 and 1913 varied from 14.39 bu. per acre for Tennessee Red to 31.52 bu. for Spanish. A comparison of seeding peanuts in rows 18 in. apart with seedings made in rows 36 in. apart for the same period and employing all the varieties used in the tests noted above gave an average yield of 20.24 bu. per acre for all seedings in 3-ft. rows and 23.38 bu. for all seedings in 18-in. rows.

Common and Turkestan varieties of alfalfa grown in 1911 gave total yields of 2,450 and 2,000 lbs. of cured hay per acre, respectively. Further tests with alfalfa have proved unsuccessful.

Six varieties of bur clover grown on the substation since 1912 are reported as giving very satisfactory results.

Of the standard grain sorghum varieties grown in 1913 and 1914 Blackhull Kafir was first in yield of cured forage and of grain, with an average production of 7,282 lbs. of forage, and 23.35 lbs. of seed per acre. Rate-of-seeding tests with grain sorghums conducted from 1912 to 1914, inclusive, and to be reported later in detail indicate that the best results will be obtained with plantings from 6 to 8 in. apart in the row.

Tests are reported for 1912 with Amber and Sumac sorghums for hay planted in 3-ft. rows with the plants spaced in the rows from 0.25 to 6 in. apart. The yields varied from 1.45 to 2.8 tons for Amber and from 6.15 to 8.7 tons for Sumac for the 6- and 0.25-in. spacings, respectively. Supplemental tests conducted in 1912 and 1913, in which the two varieties were planted in close drills at 25-, 50-, and 100-lb. rates, gave average yields of 3.9, 4.47, and 4.02 tons of cured hay per acre, respectively, for Amber and 8, 8.7, and 7.98 tons for Sumac.

Sudan grass sown in 3-ft. and 18-in. rows, and broadcasted in 1913 gave yields of hay amounting to 11,240, 10,420, and 9,400 lbs. per acre, respectively, and of seed amounting to 400, 360, and 380 lbs., respectively. Rates of seeding Sudan grass equivalent to 15, 20, 30, and 40 lbs. per acre gave total yields averaging from 4.4 to 4.55 tons per acre. Sudan grass and cowpea mixtures sown for hay gave unsatisfactory results.

Experiments in seed-bed preparation conducted in 1913 and 1914 indicated that either listing or plowing the land 6 or 8 in. deep furnished the most satisfactory seed bed for corn, cotton, and Kafir corn.

In potato variety tests Bliss Triumph, Early Rose, Irish Cobbler, and Gold Coin have given the best results, the early varieties being deemed superior for this region. In fertilizer tests with potatoes the highest average yield, amounting to 89.83 bu. per acre, was obtained with an application of 200 lbs. each of cottonseed meal and acid phosphate. The average for all untreated check plats was 60.95 bu. The lowest yield, 52.24 bu. per acre, was obtained from a 400-lb. application of sulphate of potash. From the results obtained it is concluded that acid phosphate combined with some nitrogenous fertilizer will give the best results on these soils.

[Work with field crops at the St. Kitts-Nevis experiment stations], F. Watts (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. St. Kitts-Nevis, 1915–16, pp. 3–5, 6–10, 23–28*).—This continues work previously noted (E. S. R., 35, p. 134), reporting variety tests with sweet potatoes, cassava, yams, corn, eddoes, peanuts, tobacco, and peas; field tests with teff grass and white velvet beans; and manurial and seed-selection tests with cotton at both stations.

The sweet potato varieties Brass Cannon, Playwell, and Caroline Lee again gave the highest average yields, amounting to 16,300, 15,666, and 15,288 lbs. per acre, respectively. Cassava varieties French No. 3, with an average yield of 14,612 lbs., and Jackroe, with 12,760 lbs. per acre, gave the highest yields for the 12 years the tests have been in progress. Of the yam varieties Bottle Neck Lisbon and Crop gave the highest yields, 24,750 and 22,000 lbs. per acre, respectively.

In fertilizer tests with cotton at La Guérite an increase of 24 per cent was obtained with manure and one of 19 per cent from complete fertilizer. The average yield of seed cotton for all plats for the 1915–16 season was 1,374 lbs. per acre and that of all check plats 1,340 lbs., while the average yield of the check plats for the 12-year period was 1,223 lbs. per acre and that of all the plats under experiment 1,214 lbs. At Nevis the plat receiving 4 cwt. cottonseed meal was second to the manure plat, and gave 116 lbs. per acre more than the complete fertilizer plat.

Seed selection No. 217 gave the highest yield of seed cotton per acre, 998 lbs., with No. 342(S) second, with 949 lbs.

Hay and pasture seedings, W. R. Hechler (*Iowa Sta. Circ. 39 (1917), pp. 12, figs. 3*).—The more important seeding questions are briefly discussed and suggestions made relative to the production of different hay and pasture crops in Iowa. Perennial plants, both leguminous and nonleguminous, are noted for permanent forage production, together with annuals regarded as satisfactory substitutes when permanent seedings fail or the stand is seriously injured by winter weather.

The value of cover crops, J. B. R. Dickey (*New Jersey Stas. Circ. 85 (1917), pp. 4*).—The use of leguminous cover crops is recommended as a partial substitute for high-priced nitrogenous fertilizer. It is estimated that with plowing under a good cover crop a fertilizer carrying 2 per cent nitrogen will suffice for potatoes or truck crops, while cereal crops would require no mineral nitrogen.

Directions for growing cover crops in New Jersey are briefly outlined.

Wheat and rye, F. App (*New Jersey Stas. Circ. 87 (1917), pp. 4*).—This outlines the ways and means of securing increased wheat and rye production in New Jersey.

The determination of the races of corn, R. Ricci (*Staz. Sper. Agr. Ital., 49 (1916), No. 3, pp. 219–243, fig. 1*).—This is a general review of methods advanced for the identification of the races of grains, with a discussion of their application to the identification of races of corn. Methods involving measurements of the ear and kernel are discussed at some length, with special reference to the biometric method of De Cillis (E. S. R., 26; p. 43; 28, p. 331).

Flax growing experiments, 1914 and 1915 (*Dept. Agr. and Tech. Instr. Ireland Jour., 17 (1916), No. 1, pp. 3–19*).—Fertilizer experiments supplementing others previously noted (E. S. R., 32, p. 136) and conducted at ten centers in 1913 were continued through 1914 and 1915.

The highest yield, amounting to 476.5 lbs. of scutched flax per acre, was obtained from an application of 1.5 cwt. of muriate of potash and 0.5 cwt. of sulphate of ammonia as compared with a yield of 412 lbs. per acre from

ammonium sulphate alone and 370.5 lbs. from the untreated check. Applications of 1 and 1.5 cwt. of muriate of potash resulted in yields of 434.5 and 459 lbs. per acre, respectively.

Liming tests were continued at four centers in 1914 and 1915. Increased yields of scutched flax resulting from an application of 2 tons of lime amounted to 65 lbs. per acre in 1914 and 28 lbs. in 1915. Supplementing the lime with 1 cwt. of muriate of potash at seeding time apparently increased the yield by 121 lbs. per acre in 1914 and by 45 lbs. in 1915.

Varieties of potatoes, C. F. Noll (*Pennsylvania Sta. Rpt. 1915, pp. 34–46*).—In continuation of work previously noted (E. S. R., 17, p. 1057; 23, p. 139), this reports the results of variety tests with potatoes for 1910–1914, inclusive, together with observations on the length of the growing period of a number of potato varieties, and on the shrinkage of different varieties in storage. Variety tests for each year of the 5-year period are noted separately, the data tabulated, and the results summarized.

The highest average yield of 32 varieties grown each of the five years reported was obtained from Snow and amounted to 210.5 bu. per acre of marketable tubers. Whiton White Mammoth and Heath Late Surprise, with yields of 202.3 and 198.5 bu. per acre, were second and third, respectively.

The number of days from the date of planting to the date at which the tops were considered dead, together with the average yields of 32 varieties from 1910 to 1914, are reported. The varieties were divided into two groups of 16 each, the average length of the growing period for the first group being 107 days, with an average yield of 149 bu. per acre, and of the second group 127 days, with an average yield of 183.7 bu.

Shrinkage experiments included observations on 26 varieties from October 22 to April 23. The total shrinkage varied from 7.88 per cent for Manistee to 14.32 per cent for Petoskey, and averaged 10 per cent.

Potato grades recommended by the United States Department of Agriculture and the United States Food Administration (*U. S. Dept. Agr., Bur. Markets Doc. 7 (1917), pp. 4*).—Potato grades known as U. S. Grade No. 1 and U. S. Grade No. 2 are briefly described and their adoption urged to meet the requirements of the recent ruling of the Federal Reserve Board authorizing member banks to make loans against warehouse receipts for potatoes properly graded, packed, stored, and insured, as well as to meet the needs of growers, dealers, and consumers.

Rice in the Americas (*Bul. Pan Amer. Union, 44 (1917), No. 2, pp. 137–160, figs. 23*).—A historical and economic review of rice production in North and South America, including a discussion of the cultivation of the Zizania species known as "wild rice" by the native Indian tribes of North America. The first introduction of cultivated rice in the Americas seems to have been in Brazil during the sixteenth century. Statistics are given on the value of the crop in the various countries of the Pan American Union.

The soy bean in New Hampshire, F. S. Prince (*New Hampshire Sta. Bul. 181 (1917), pp. 20, figs. 7*).—The adaptation and uses of the soy bean in New Hampshire are discussed and the field practices and cultural methods employed in growing the crop for forage outlined.

Tests with inoculated and uninoculated soy bean plants in 1915 gave yields of green forage amounting to 7.192 and 4.672 tons per acre, respectively. An average yield of 16,617 lbs. of green forage per acre was obtained from 16 varieties grown at the station, varying from 7,826 lbs. for Wisconsin Early Black to 20,253 lbs. per acre for Haberlandt. An analysis of 5 varieties of corn showed an average yield in dry matter of 5,751 lbs. and in protein of 463 lbs. per acre.

as compared with yields of 4,470 lbs. of dry matter and 867 lbs. of protein for 5 varieties of soy beans.

Soy beans for Pennsylvania, C. F. NOLL (*Pennsylvania Sta. Rpt. 1915, pp. 47–57, pls. 2*).—The adaptation of soy beans to Pennsylvania conditions, the uses of the crop, and the field practices and cultural methods employed in its production both for grain and forage are discussed, and rotation and variety tests noted. The advantages of soy beans over cowpeas in Pennsylvania are briefly outlined.

In variety tests conducted during 1913 and 1914, Ohio 7496, Medium Green, and Ohio 9016 were deemed the three leading varieties for hay production, with average yields of 5,439, 4,694, and 4,540 lbs. per acre, respectively. Wilson, Chestnut, and Ohio 10015, with average yields of grain amounting to 13.9, 13.7, and 13.7 bu. per acre, respectively, were the leading varieties for grain production.

Another Stizolobium from the Philippine Islands, F. A. COFFMAN (*Philippine Agr. Rev.* [*English Ed.*], *9* (*1916*), *No. 4, pp. 282–287, pls. 4*).—The author reports observations on hybrid and spotted Stizolobiums grown in comparison with the Lyon bean (*S. niveum*) in cultural tests at the Singalong experiment station. The hybrid is thought to be the result of a cross between *S. niveum* and *S. deeringianum*, while the spotted bean closely resembles *S. pachylobium*, as described by Piper and Tracy (E. S. R., 23, p. 338) and Sahr (E. S. R., 30, p. 828). The tests are being continued at the Singalong and La Carlota stations.

The spotted bean is deemed superior to either the hybrid or the Lyon, while the hybrid has proved superior in many ways to the Lyon. The tests now in progress confirm these observations and in addition indicate that the spotted and hybrid beans possess a decided resistance to a fungus disease, apparently a rust, to which the Lyon seems to be peculiarly susceptible.

The results of observations to date indicate that the hybrid and spotted beans are new types of Stizolobium. The former may prove to be a so-called "fixed hybrid" and the latter may be a mutant, although further observations of these types in comparison with the original types are deemed necessary to establish this point definitely.

The author suggests that the spotted bean may have an origin similar to that of the Georgia velvent bean, as described by Belling (E. S. R., 33, p. 533), having lost the factor for late maturity, and also that for producing large clusters of pods. *S. pachylobium* is described as producing from 30 to 50 pods per cluster, while this spotted type has never been observed to produce over 15 pods per cluster. A detailed description is given of the spotted bean. Due to the fact that this type produces numerous root nodules, makes a large initial growth of vine, blossoms early, matures seed sooner and more evenly than the Lyon bean and apparently earlier than the Florida velvet bean, does not shatter its seed, and possesses no stinging hairs on the pods, it is thought that it may prove valuable as a cover crop for the southern United States. If it matures within five months, as is the case in the Philippines, it can probably be grown considerably farther north than many of the other Stizolobiums.

Sweet clover: Harvesting and thrashing the seed crop, H. S. COE (*U. S. Dept. Agr., Farmers' Bul. 836* (*1917*), *pp. 23, figs. 13*).—Detailed directions are given for harvesting and thrashing the seed crop of sweet clover, with special reference to harvesting machinery.

It is recommended as a general practice to utilize the second crop of the second season for seed, the time of harvesting depending largely on the machinery used.

Several factors other than shattering are said to affect the yield of sweet clover seed, resulting in a variation of from 2 to 10 bu. of recleaned seed per acre.

The value of sweet clover straw as a roughage for live stock is briefly noted. Analyses by the Bureau of Chemistry are reported.

Tobacco experiments [1914], W. Frear, O. Olson, H. R. Kraybill, and E. S. Ebb (*Pennsylvania Sta. Rpt. 1915, pp. 311–365, pls. 15*).—The further selection of Seedleaf or Broadleaf strains of tobacco in Lancaster County, fertilizer studies, studies of wrapper and binder tobacco in Clinton County, and the improvement of the burning qualities of cigar tobacco in York and Clinton Counties are reported for 1914, in continuation of work previously noted (E. S. R., 35, p. 532). Detailed notes on crop conditions, yields, plant measurements, leaf quality, and rainfall are presented in tabular form.

The ten strains of Seedleaf tobacco selected for trial in 1913 were subjected to further selection in 1914, eliminating all but Slaughter, Espenshade, Hostetter, and Cooper. A new Seedleaf strain quite widely grown in the Lancaster County tobacco region and known as Hoffman was included in the 1914 tests and is of the preferred form for filler tobacco. The average yields of three single-line selections of each strain for 1914 amounted to 2,422.6 lbs., per acre for Slaughter, 1,965 for Hostetter, 2,291.8 for Espenshade, 2,123 for Cooper, and 2,267.6 for Hoffman, with extreme differences in yield between the various selections of each strain of 592.5, 622.5, 86.5, 178, and 287 lbs., respectively. The differences in the Espenshade and Cooper strains are deemed no greater than those due to soil variation, but in the case of the other strains, especially Slaughter and Hostetter, it is thought that continued single-line selection may result in marked increases in yield.

Control experiments with manure alone and manure supplemented with acid phosphate and sulphate of potash for tobacco in Lancaster County resulted in average yields of 1,713 lbs. per acre for manure alone and 1,887 lbs. for manure and commercial fertilizers, as compared with 1,325 lbs. from the unfertilized check. The quality of the tobacco grown under the different fertilizer treatments was studied by cigar tests made from the bulk-sweated leaf and resulted in an average score of 67.5 points for tobacco grown with manure alone and 78.5 points for that grown with manure and commercial fertilizers. Five cooperative fertilizer experiments in the county resulted in average yields of 1,694 lbs. per acre for manure alone and 1,716 lbs. for manure and commercial fertilizers.

The 1914 trials of wrapper and binder types of tobacco for the light Huntington sandy loam soils of Clinton and Lycoming Counties included the strains previously tested and, in addition, two strains of Connecticut Havana (Suffield) and one local Havana strain (King). Five strains were harvested by priming and gave acre yields of 1,312 lbs. for Shade Cuban, 1,621 for Big Cuban, 1,082 for Sumatra (U. S. seed), 1,828 for Ohio Hybrid, and 1,761 for Halladay Hybrid. Of the remaining 13 strains harvested on the stalk, Slaughter was highest with a yield of 2,103 lbs. per acre and Havana Suffield second with 1,604 lbs. These tobaccos were scored for quality in 1915 from cigars and compared with the highest-grade Sumatran wrappers. Big Cuban, primed, with a total of 71 points, was first, and Sumatra and Halladay, primed, second and third, respectively, with total scores of 70.6 and 68.7 points.

Spacing and topping experiments were continued, employing normal spacings of 28 by 42 in. and close spacings of 28 by 36 in. for the Broadleaf types (Pennsylvania and Connecticut); and normal spacings of 14 by 42 in. and close spacings of 14 by 36 in. for Havana strains (Local and Wisconsin). Topping heights were: High, for Broadleaf, 16 leaves; for Havana, 18 leaves; low, for Broad-

leaf, 12 leaves; for Havana, 14 leaves. These treatments resulted in the average yields of stripped leaves indicated below.

Average yields of stripped leaves.

Type of tobacco.	Normal space.		Close space.	
	Topped high.	Topped low.	Topped high.	Topped low.
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*
Broadleaf	1,885	1,678	1,693	1,713
Havana	1,125	1,150	1,585	1,301
All	1,504	1,414	1,639	1,507

The time required for harvesting by priming five varieties in 1914 varied from 8 days for Big Cuban, with a yield of 20 leaves per plant, to 17 days for Ohio Hybrid and Halladay, with yields of 23 leaves each. The cost of harvesting and stripping Halladay Hybrid in 1914 was estimated at $23.85 for two rows primed and $4.50 for two rows harvested on the stalk. Yields were obtained amounting to 197 and 169.5 pounds, respectively, for the two rows harvested by each method.

Considerable data are presented on the quality, fire-holding capacity, and composition of the ash of tobacco grown in York and Clinton Counties in 1913 and 1914 as affected by different fertilizer treatments in an effort to improve the burning capacity of the Connecticut Havana wrapper tobacco grown in these localities. The results obtained in York County showed that where the potash-chlorin ratio exceeded 6 the burn was fairly good, but where the ratio was below 3 the burn was poor, and that the variability of chlorin much exceeded that of potash. It is concluded that "the manurial practices of the local tobacco growers, the instant improvement of the crops when fertilizers of proper composition are used, and the progressive decrease in chlorin content as the better practice is continued on the same land, all show that, with an entirely practicable change in fertilizer treatment of the lands intended for tobacco, the tobacco growers can, at once, and without serious increase in expense, relieve the crop from the chlorin injury."

The results of the Clinton County experiments are held to indicate that the direct treatment of tobacco with muriate-containing fertilizers should be avoided. An excess of chlorin remaining from such treatment in these open, sandy loam soils may be largely removed by a leafy crop and by exposure to winter rains and snow before tobacco planting. The use of commercial fertilizers containing potash as sulphate or carbonate gave tobacco of a better burning quality than did stable manure. The imperfections in the burn are not altogether removed by care against chlorin injury alone, but related investigations upon the influence of the structure and organic composition of the leaf may throw additional light upon the subject.

Harvesting tobacco by priming or picking the leaves as compared with cutting the stalks, E. G. Moss (*North Carolina Sta. Bul. 238 (1917), pp. 5–11, figs. 2*).—This reports experiments conducted in cooperation with the U. S. Department of Agriculture during 1913–1916, inclusive, at the tobacco station, near Oxford, Granville County, to determine the best harvesting method for the production of bright smoking tobacco.

Each year of the experiment showed materially increased yields from priming the leaves as they matured over cutting the stalks, the increase averaging 36 per cent for the four-year period. The average increased yield in favor of

priming amounted to 240 lbs. of cured leaf per acre, with a crop value of $49.03. The average cost of harvesting tobacco by priming was estimated to be $12.79 per acre, or $1.41 per 100 lbs. of cured leaf, for the average yield obtained, while harvesting by cutting was estimated to have cost $9.08 per acre, or $1.36 per 100 lbs. of cured leaf secured.

Other advantages claimed for the priming method are that the tobacco land can be maintained in a higher state of fertility without serious danger of injury to the quality of the cured leaf; that tobacco for priming can be topped from two to four leaves higher than for cutting, and on rich land from four to six leaves higher; and that less barn room, storage room, and fuel are required per pound of cured leaf.

[Methods of wheat culture], H. DEVAUX, MENEGAUX, E. SCHRIBAUX, and TISSERAND (*Compt. Rend. Acad. Agr. France, 3* (*1917*), *Nos. 3, pp. 93–103; 4, pp. 108–113; Prog. Agr. et Vit.* (*Ed. l'Est-Centre*), *38* (*1917*), *No. 7, pp. 155–160; Vie Agr. et Rurale, 7* (*1917*), *No. 10, pp. 175–178*).—The author reports studies in the intensive cultivation of wheat on gravelly soils near Bordeaux. The plan of the experiment involved (1) early seeding, (2) seeding in rows sufficiently far apart, 30 to 40 cm. (11.8 to 15.7 in.) or more, to enable the plants to secure a vigorous growth and to furnish them a larger feeding area, (3) a hilling up of the plants two or three times, the first time about three weeks after seeding, to stimulate the production of new roots and especially of new stems, and (4) the careful preparation of the seed bed.

Observations are noted on seedings of four varities made August 19, 1916, which responded very quickly to the treatment outlined. In January, 1917, 6 square meters (7.18 sq. yds.) of a variety known as Bordeaux Red Hybrid were cut and examined for tillers, and gave 177 plants with a total of 261 stems, 116 of which were produced on the 6 best stools. By isolating these high-producing stools the author believes that plants producing from 50 to 100 stems could be developed, resulting in the production of from 300 to 600 stems per square meter. The results obtained by Demtschinsky in transplanting wheat are cited, together with previous results obtained by the author in support of this method. Planting distances of from 30 to 40 cm. between plants and of from 40 to 50 cm. between rows are deemed best.

E. Schribaux, in discussing the results noted above, questioned the economic value of the increased yields owing to the comparatively small area devoted to the production of wheat in France, sacrificing early maturity in the grain for potency, and to the immense amount of labor such intensified methods would require for general production.

New culture methods for wheat and other cereals, H. DEVAUX (*Rev. Sci.* [*Paris*], *55* (*1917*), *I, No. 5, pp. 140–149, fig. 1; abs. in Nature* [*London*], *99* (*1917*), *No. 2474, pp. 91, 92*).—A slightly more detailed exposition of the above, with additional notes on the application of the methods described to cereals other than wheat.

More wheat for Michigan, J. F. COX (*Michigan Sta. Circ. 34* (*1917*), *pp. 3–10, figs. 4*).—Recommendations are made for increasing wheat production in Michigan.

Methods of controlling or eradicating the wild oat in the hard spring-wheat area, H. R. CATES (*U. S. Dept. Agr., Farmers' Bul. 833* (*1917*), *pp. 16, figs. 9*).—The wild oat, deemed the most prevalent weed in the hard spring-wheat area and said to be most frequently introduced into noninfested fields by the use of impure seed wheat, is described and its control or eradication discussed. The general precautions to be taken under all circumstances in dealing with the weed are explained and efficient tillage methods, differing with soil

and climatic conditions, recommended as the best means of control or eradication.

Six special methods of procedure which have proved effective under different conditions are indicated and include summer fallow or pasture, winter rye, meadow, intertilled crops, early barley, and barley and rye. The discussion applies particularly to North and South Dakota and to Minnesota and it is stated that it may not be suited to conditions in the Pacific Coast hard spring-wheat area.

HORTICULTURE.

Around the year in the garden, F. F. Rockwell (*New York: The Macmillan Co., 1917, pp. XX+350, pls. 32, figs. 27*).—A seasonable guide and reminder for work with vegetables, fruits, and flowers, outdoors and under glass.

The garden under glass, W. F. Rowles (*Philadelphia: J. B. Lippincott Co., 1917, pp. XVI+368, pls. 33, figs. 77*).—A popular treatise on the culture of fruits, flowers, and vegetables under glass.

The amateur's guide to gardening in southern India, H. Houghton (*Madras, India: Higginbothams Ltd., 1917, pp. VI+248, figs. 67*).—A concise guide and textbook on gardening in southern India. Some 1,400 plants are dealt with, including vegetables, flowering annuals, foliage plants, flowering shrubs, and climbing and bulbous plants. Lawn making is also briefly considered.

Greenhouses.—Their construction and equipment, W. J. Wright (*New York: Orange Judd Co., 1917, pp. XVI+269, pl. 1, figs. 131*).—The present treatise, the author states in substance, is supplementary to the old standard work of Taft on the subject, and emphasizes present-day features.

The introductory chapter contains a general survey of the subject. The successive chapters deal with sash-bed construction; general considerations on the greenhouse proper; greenhouse architecture; structural material; methods of erecting framework; glazing and painting; ventilation and ventilating machinery; beds, benches, and walks; greenhouse heating; hot water installation; steam installation; boilers, fuels, and flues; water supply and irrigation; concrete construction; and plans and estimates.

Forcing plants and twigs (*Missouri Bot. Gard. Bul., 5 (1917), No. 10, pp. 145–148*).—A discussion of methods of forcing plants and twigs into growth out of their normal season, including a list of shrubs, twigs, and herbaceous perennials and biennials suitable for forcing.

A century of certificated plants introduced from China by Ernest H. Wilson, compiled by E. H. Wilson (*Jour. Roy. Hort. Soc., 42 (1916), No. 1, pp. 35–38*).—A list is given of 100 plants certificated by the Royal Horticultural Society, all of which are hardy in some part or other of the British Isles and a great majority are perfectly hardy everywhere in Great Britain and Ireland.

Inspection, certification, and transportation of nursery stock, G. G. Atwood (*N. Y. Dept. Agr. Circ. 160 (1917), pp. 33*).—This circular gives a brief synopsis of the laws and regulations of the United States, the several States, and Canada (corrected to September, 1917) relative to the inspection, certification, and transportation of nursery stock.

Sections 263, 264, and 265 of the Agricultural Law of importance to nurserymen (*N. Y. Dept. Agr. Circ. 161 [1917], pp. 2*).—The sections of the Agricultural Law of New York State, here considered, have to do with the sale of fruit-bearing trees, damages accruing from sale of trees, certification of tree agents, and the prevention of the spread of insect pests and fungus diseases among trees and plants.

Regulations under the Destructive Insect and Pest Act, with instructions to importers and exporters of trees, plants, and other nursery stock, C. G. Hewitt (*Canada Dept. Agr., Ent. Branch Circ. 10* (*1917*), *pp. 12*).—This circular is intended to guide persons importing plants and other nursery stock into Canada. A statement is also given of conditions under which trees, plants, and other nursery stock may be exported to the United taStes.

Spraying for profit, H. E. Weed (*Cleveland, Ohio: Hort. Pub. Co., 1917, 21. ed., rev., pp. 64, figs. 37*).—A practical handbook dealing with the control of the more common injurious insects and fungus diseases (E. S. R., 11, p. 371). The present edition has been revised and rewritten to include modern practice.

Rules and regulations of the Secretary of Agriculture under the United States Standard Container Act of August 31, 1916 (*U. S. Dept. Agr., Office Sec. Circ. 76* (*1917*), *pp. 8*).—This circular contains the text of the act (E. S. R., 35, p. 598) to fix standards for baskets and other containers for small fruits, berries, and vegetables, and for other purposes, approved August 31, 1916, together with the rules and regulations governing the act in force and effective on and after November 1, 1917.

[Report of] department of horticulture, M. G. Kains (*Pennsylvania Sta. Rpt. 1915, pp. 467, 468, pls. 2*).—A brief progress report of different investigations with vegetables for the year ended June 30, 1915.

The work with tomatoes, asparagus, and cabbage was continued. The cultural experiments with cabbage have been published in Bulletin 137 (E. S. R., 34, p. 636). Little progress has been made in the breeding work with early cabbage because of the difficulty experienced in successfully wintering the plants. From certain plants successfully carried through the winter line-bred seed was not secured because the flowers proved sterile to their own pollen. When the blossoms were fertilized with pollen from a sister plant a large amount of seed was secured.

Breeding work with tomatoes (E. S. R., 35, p. 235), although yet incomplete, shows the importance of considering the plant as the unit of selection. At the same time it has shown that not all plants of superior appearance are able to transmit their superior characteristics to their progeny. As a result of work conducted for three years strains have been isolated which appear to possess superiority to the best of commercial strains in respect to earliness, productiveness, and general character of fruit.

The variety test with asparagus which has been in progress for the past six years shows the superiority of Palmetto to other varieties tested. The planting of large healthy asparagus crowns as compared with small crowns has resulted in an increase in monetary value of more than $100 an acre. Another experiment has shown the superiority of 1-year-old as compared with 2-year-old crowns.

[Report on horticultural investigations at the Beeville substation, 1910–1914], E. E. Binford (*Texas Sta. Bul. 214* (*1917*), *pp. 19, 20–26, 27, figs. 3*).—The results of tests and experiments with vegetables are presented and recommendations are made relative to the best varieties and methods of culture.

Observations made on a number of varieties of citrus fruits grown at the substation indicate that the Dugat and Satsuma oranges are the best varieties for the section and make very satisfactory yields. The lemon is not a satisfactory crop. The pomelo is less frost resistant than the orange but produces well. The Duncan, Pernambuco, and Royal varieties are especially recommended. The kumquat is very successful. Recommendations are given for the management of citrus orchards.

Variety tests of peaches, plums, figs, grapes, pears, apples, and apricots have given indifferent results. Japanese persimmons make very satisfactory yields. Blackberries and dewberries are successfully grown but strawberries do not stand the summer well.

Vegetable culture in Malaya, F. G. SPRING and J. N. MILSUM (*Dept. Agr. Fed. Malay States Bul. 26 (1917), pp. 40+II*).—A popular treatise on the subject, including descriptive lists of plants adapted for culture in Malaya with data on their specific treatment.

Standardization of vegetables, S. J. COOK (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 475–479*).—A paper on this subject read before the Second Pan American Scientific Congress, held at Washington, D. C., December 27, 1915, to January 8, 1916.

Saving beans and peas for food and seeding purposes, J. P. HELYAR (*New Jersey Stas. Circ. 86 (1917), pp. 4*).—This circular discusses methods of harvesting and curing and thrashing and cleaning beans and peas, storage conditions, treatment for weevils, and testing seeds for germinative ability. Some notes on the home drying of beans and peas for food, based on Farmers' Bulletin 841 noted on page 12, are included.

Culture of the Globe artichoke, J. W. WELLINGTON (*New York State Sta. Bul. 435 (1917), pp. 311–319, pls. 2, figs. 3*).—This bulletin discusses the Globe artichoke with reference to its botany, history, varieties, culture, winter protection, insect and fungus troubles, and uses.

A large number of Green Globe artichoke plants has been grown at the station since 1913, and observations have been made on variations within the variety. A table is here given showing the yield of 50 individual plants in 1916. The number of edible flower buds produced per plant ranged from none in several cases to 18 in the case of two plants, indicating that propagation by means of suckers is the most satisfactory method for maintaining the fine-yielding strains.

Asparagus, H. C. THOMPSON (*U. S. Dept. Agr., Farmers' Bul. 829 (1917), pp. 20, figs. 10*).—A treatise on asparagus culture discussing the extent and value of the industry, soils for asparagus and their preparation, manures, and fertilizers, growing asparagus roots, planting asparagus roots, cultivation of asparagus, care after the cutting season, duration of a plantation, harvesting and packing, asparagus varieties, asparagus rust, insects, canning, forcing, and cost of production and returns.

A variety test of cabbage, C. E. MYERS (*Pennsylvania Sta. Rpt. 1915, pp. 468–495, pls. 21*).—In continuation of previous reports (E. S. R., 34, p. 146) a full report is given on the strain tests of cabbage conducted by the station during the period 1909 to 1914. Varieties of eight different groups of cabbage are considered with reference to earliness, quality, productiveness, and other characteristics.

Fall v. spring planting, J. C. WHITTEN (*Trans. Ind. Hort. Soc. 1916, pp. 291–304*).—A discussion of this subject based upon investigations conducted at the Missouri Experiment Station (E. S. R., 37, p. 743).

Generally speaking, the best results have been secured by planting fruit trees in the fall. Planting the fruit trees late in the fall just before the ground freezes has given better results than early fall planting.

Orchard planting costs, F. I. ODELL (*Trans. Ind. Hort. Soc. 1916, pp. 81–87*).—The data secured from planting operations conducted under the direction of the author during the past five years show a cost of $7.13 per acre for buying and setting out yearling apple and peach trees.

Orchard fertilization tests, W. H. ALDERMAN (*Trans. Ind. Hort. Soc. 1916, pp. 40–56, figs. 6*).—In this paper the author summarizes the results of fer-

tilizer tests with apples, and also with peaches (E. S. R., 33, p. 840), conducted at the West Virginia Experiment Station during the past several years.

The results in general indicate that as far as apples are concerned fertilizers would be wasted in many orchards, especially if they are under cultivation. On the other hand, orchards in sod in a low state of vigor would doubtless respond to liberal applications of nitrogen in some form and perhaps phosphoric acid. Peach orchards in only moderate vigor were found to respond promptly to applications of nitrogen, but potash or phosphoric acid, if applied at all, should be used only in a small way for test purposes.

The effect of pruning on the set of fruit, E. J. Kraus (*Trans. Ind. Hort. Soc., 1916, pp. 209–226, figs. 2*).—A discussion of this subject based upon investigations conducted at the Oregon Experiment Station (E. S. R., 36, p. 237).

Dusting v. spraying, W. S. Brock (*Trans. Ind. Hort. Soc. 1916, pp. 69–81, figs. 3*).—In this paper the author briefly reviews the results secured at a number of experiment stations with the dust spray and describes the experiments conducted in a number of orchards under the direction of the Illinois Station in 1915 and 1916.

Summarizing the results secured it is concluded that liquid spray is more efficient than dust spray as a means of controlling fungi, can be applied during high winds, costs less, and is necessary to use as dormant sprays. Dust spray can be applied more rapidly, requires less labor and lighter equipment for hauling through the orchard, its preparation is less complicated, and it is possible to use it late in the season when hot weather makes it impossible to spray with lime-sulphur.

[Report of] department of experimental pomology, J. P. Stewart and W. C. Gillespie (*Pennsylvania Sta. Rpt. 1915, pp. 435–464*).—This report contains a brief statement of the work of the department, together with tabular results to the close of 1914 obtained from the various apple experiments. The work in the young orchards has been previously noted in Bulletin 134 of the station (E. S. R., 33, p. 238), which is here reprinted. The work in bearing orchards through the season of 1915 is reported in Bulletin 141 of the station (E. S. R., 35, p. 644).

The Duchess apple improved, M. J. Dorsey (*Jour. Heredity, 8 (1917), No. 12, pp. 565–567, fig. 1*).—In this paper the author describes and illustrates an improved type of the Duchess apple that has been found by W. Bardwell in his orchard near Excelsior, Minn. From the evidence at hand the author is inclined to believe that this new type of Duchess is a good illustration of a variety being improved by bud variation.

Developing foreign markets for apples, C. W. Moomaw (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 646–665*).—A paper read before the Second Pan American Scientific Congress, held at Washington, D. C., December 27, 1915, to January 8, 1916, containing a statistical review of the apple trade between the United States and foreign countries, together with suggestions for extending foreign markets for apples.

The peaches of New York, U. P. Hedrick et al. (*New York State Sta. Rpt. 1916, pt. 2, pp. XIII+541, pls. 95*).—This is the fifth of the station's monographs on the fruits of temperate North America (E. S. R., 33, p. 439). The work is similar in nature and purposes to the previous volumes. The successive chapters deal with the history of the peach, botanical and horticultural classifications of the peach, commercial peach growing in America, peach growing in New York, leading varieties of peaches, and minor varieties of peaches.

The most important varieties are illustrated in colors, and all information that was thought would be helpful in breeding peaches, as well as to students

of ecology and of plant distribution, has been included. As in the previous fruit books some prominence is given in footnotes to biographical sketches of persons connected with the development of the peach industry. The work concludes with a bibliography and references.

Pruning experiments with peaches: Results of first two seasons, M. A. Blake and C. H. Connors (*New Jersey Stas. Circ. 83 (1917), pp. 8*).—This circular is a summary of a bulletin to be presented at a later date. It summarizes the results for two seasons of extensive pruning experiments started in the spring of 1912. An outline is given of the experiments, and records are given showing the average growth and circumference made by three different varieties subjected to various forms of pruning both at Vineland and New Brunswick. The data given are intended to serve as a record and no conclusions are thus far drawn.

Packing peaches in Georgia carriers, L. G. Gillam (*New Jersey Stas. Circ. 82 (1917), pp. 8, figs. 4*).—The directions herein given have been revised from Bulletin 284 of the station (E. S. R., 34, p. 639).

The blueberry in New Hampshire, J. H. Gourley (*New Hampshire Sta. Circ. 18 (1917), pp. 3–12, figs. 4*).—This circular comprises a preliminary report on the blueberry industry in New Hampshire. Data are given showing blueberry shipments from different parts of the State in 1916 and yields of individual blueberry pastures, together with information relative to methods of harvesting the crop and burning over the pastures. A partial bibliography of the literature dealing with the propagation, culture, and handling of blueberries is appended.

The banana as an emergency food crop, J. E. Higgins (*Hawaii Sta. Ext. Bul. 6 (1917), pp. 16, figs. 3*).—In addition to a discussion of cultural methods, the banana and banana by-products are considered with reference to their nutritive value as compared with other foods.

Comparative results of moderate and severe pruning, H. S. Reed (*Cal. Citrogr., 3 (1917), No. 2, pp. 25, 38, figs. 8*).—A progress report on some work started by the California Citrus Substation in 1915 in an old navel orange grove.

As measured by the yields for two seasons after pruning, both moderate and severe pruning have decreased the yield. The decrease was greater on the severely pruned trees. Thus far the differences in growth resulting from pruning are not pronounced. The experiment is to be continued for some time.

The principles and practices of cooperation applied to citrus production and distribution, G. H. Powell (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 665–671*).—In this paper, read before the Second Pan American Scientific Congress, held at Washington, D. C., December 27, 1915, to January 8, 1916, the author gives an account of the various agencies cooperating in California in the production, distribution, and sale of citrus fruits.

Citrus culture in Surinam, J. A. Liems (*Dept. Landb. Suriname Bul. 35 (1917), pp. 29, pls. 7, figs. 2*).—A treatise on the culture, harvesting, and marketing of citrus fruits, including a brief review of cultural demonstrations conducted at Surinam for a number of years.

Hints on coffee growing in British East Africa, M. D. le Poer Trench (*Dept. Agr. Brit. East Africa Bul. 2 (1917), pp. 1–19, figs. 5*).—A popular account of the methods of planting, curing, and marketing coffee, based upon the author's experience in British East Africa and in Jamaica.

The litchi in Hawaii, J. E. Higgins (*Hawaii Sta. Bul. 44 (1917), pp. 21, pls. 5*).—An account of the litchi based on cultural experiments conducted at the station and upon data gathered from growers in Hawaii and elsewhere. The

litchi is discussed with reference to its synonymy, history and distribution, natural requirements, cultural requirements, nature of the crop and its preparation for market, use as food including an analysis and directions for preserving the fruit, insects and mites, varieties, and botanical status and relationships.

The palms of British India and Ceylon, indigenous and introduced, E. BLATTER (*Jour. Bombay Nat. Hist. Soc., 23 (1915), Nos. 3, pp. 516–531, pls. 6; 4, pp. 737–744, pls. 5; 24 (1915), No. 1, pp. 66–71, pl. 1; 24 (1916), Nos. 2, pp. 329–340, pls. 3; 3, pp. 507–538, pls. 5; 4, pp. 673–688, pls. 7*).—In continuation of previous articles (E. S. R., 33, p. 841) a descriptive account is given of a number of additional native and introduced palms of British India and Ceylon.

Selecting nut trees for planting, C. A. REED (*Amer. Forestry, 23 (1917), No. 286, pp. 619–624, figs. 8*).—In this paper the author calls attention to the lack of pomological varieties among our native species of nuts, and suggests the utilization of our present system of national highways for growing large numbers of seedling nuts from which to select varieties.

The carnation yearbook, 1917, edited by J. S. BRUNTON (*Burnley, England: The Perpetual Flowering Carnation Society, 1917, pp. IV+68, figs. 19*).—The yearbook contains the annual report of The Perpetual Flowering Carnation Society of England, including exhibition notes, a list of varieties registered since 1907 by this society, and a list of varieties registered by The American Carnation Society in 1916.

The rose annual for 1917 of the National Rose Society, edited by H. R. DARLINGTON and C. PAGE (*London: Nat. Rose Soc., 1917, pp. 175, pls. 36, fig. 1*).—In addition to the report of the National Rose Society of Great Britain, the annual contains articles by various authorities on different phases of rose culture, varieties, etc., together with an analysis of the 1916 rose season.

FORESTRY.

[Report of] department of forestry, J. A. FERGUSON (*Pennsylvania Sta. Rpt. 1915, pp. 465, 466*).—A new willow holt was established during the year and small plantings of several forest species were made. In the nursery seed beds, seedlings of deep-rooted species such as red pine and Scotch pine demonstrated their superiority as compared with shallow-rooted species such as European larch and Norway spruce in surviving the dry summer of 1915.

A test was made of 1-year-old black walnut seedlings, root-pruned and transplanted, as compared with seedlings allowed to grow for 2 years undisturbed. Two hundred undisturbed seedlings made an average second year growth of 5.25 in. as compared with an average second year growth of 2 in. for 200 root-pruned and transplanted seedlings.

Two-year seedlings of lodgepole pine were exposed to the sun before planting for lengths of time ranging from 2 up to 300 minutes. Exposures of over 10 minutes resulted in losses of from half to all of the seedlings as the time of exposure increased. The amounts of damage for exposures of 10 minutes or less are not conclusive. Of seedlings exposed for 2 minutes, 76 per cent were alive on September 17; of seedlings exposed for 4 minutes, 93 per cent were alive; and of seedlings exposed for 10 minutes, 83 per cent were alive.

Some new experiments and miscellaneous work being conducted by the department are briefly noted.

[The results of tree planting on the Belle Fourche reclamation project], B. AUNE (*U. S. Dept. Agr., Bur. Plant Indus., Work Belle Fourche Expt. Farm, 1916, pp. 26–28*).—Notes and data are given on the condition and size in 1916 of various kinds of trees for shade, ornamental, and windbreak purposes that

have been planted at different periods since 1909. A list is also given of shrubs recommended for ornamental plantings.

Annual report of the director of forestry of the Philippine Islands for the fiscal year ended December 31, 1916, A. F. FISCHER (*Ann. Rpt. Dir. Forestry P. I., 1916, pp. 83*).—This is the usual report relative to the administration, investigation, management, reconnoissance, and miscellaneous work for the year ended December 31, 1916. Data showing homestead and timber licenses, utilization of forest products from public forests, timber cut, exports and imports, revenues and expenditures are appended.

Some factors influencing the reproduction of red spruce, balsam fir, and white pine, B. MOORE (*Jour. Forestry, 15 (1917), No. 7, pp. 827–853, figs. 4*).—The investigation here reported was conducted on Mount Desert Island, Me., with the view of determining the factors governing the reproduction of the more important coniferous trees of northern New England.

Choosing the best tree seeds, C. J. KRAEBEL (*Jour. Heredity, 8 (1917), No. 11, pp. 483–492, figs. 6*).—In this article the author describes a study of Douglas fir seed which is being carried out at the Wind River Experiment Station, near Carson, Wash. The subject matter is based largely on a previous progress report of the experiment by Willis and Hofmann (E. S. R., 33, p. 739).

A bibliography of literature dealing with the influence of the source of seed on trees is included.

Utilization and reforesting of chestnut blighted lands, L. C. BARNES (*Jour. Forestry, 15 (1917), No. 7, pp. 854–858*).—This paper is based on reforestation work conducted on the Nittany State Forest in Pennsylvania.

Accelerated growth of spruce after cutting in the Adirondacks, A. B. RECKNAGEL (*Jour. Forestry, 15 (1917), No. 7, pp. 896–898*).—Some measurements showing increased growth after thinnings made by the Cornell department of forestry on a forest tract in St. Lawrence County, N. Y., are here presented.

Note on babul (Acacia arabica), J. D. M. KIRWAN ([*Indian*] *Forest Bul. 35 (1917), pp. 14, pl. 1*).—A descriptive account of this tree, which is indigenous to several sections of India, including an actual specimen section of the wood.

The ohia lehua trees of Hawaii, J. F. ROCK (*Bd. Agr. and Forestry Hawaii, Div. Forestry Bot. Bul. 4 (1917), pp. 76, figs. 36*).—A revision of the Hawaiian species of the genus Metrosideros, with special reference to the varieties and forms of *Metrosideros collina*.

Variations among eucalypts in plantations, L. TRABUT (*Bul. Sta. Forest. Nord Afrique, 1 (1917), No. 5, pp. 140–155, pls. 6, figs. 6*).—A discussion of variant forms of Eucalyptus, including descriptions of some hybrids observed principally in Algeria.

Ray tracheids in Quercus alba, S. J. RECORD (*Bot. Gaz., 64 (1917), No. 5, p. 437, fig. 1*).—In this note the author calls attention to the presence of ray tracheids in the wood of *Q. alba*. It is believed that this is the first record of the occurrence of ray tracheids in the woods of the dicotyledons.

Measurements of "bark renewal" in Hevea, L. E. CAMPBELL (*Dept. Agr. Ceylon Bul. 33 (1917), pp. 24*).—In continuation of previous studies of tapping systems in relation to the physiological processes of the rubber tree (E. S. R., 34, p. 47), certain conclusions relative to the effects of various types of tapping on the rapidity of cortex renewal are here presented.

Trees tapped daily throughout the year resulted in poor cortex renewal as compared with trees tapped on alternate days and every third day. Good first renewals were shown by trees tapped by two cuts on one quarter, one cut sloping upward to the left on one half, and two V cuts on one half.

In the case of first tapping the renewal may be considered good if the renewed cortex is 85 per cent of the thickness of the untapped cortex within three years of tapping. The renewed cortex of some old trees which had been severely tapped had an almost uniform thickness of about 5 mm., or 50 per cent of the thickness of untapped cortex.

Hevea tapping results, Experiment Station, Peradeniya, 1916, T. Petch (*Dept. Agr. Ceylon Bul. 34* (*1917*), *pp. 10*).—A progress report on tapping experiments started in 1912 (E. S. R., 36, p. 243) and on some experiments started in 1914–15. V tapping is being compared with simple oblique cuts, tapping continuously on one quarter with tapping on the opposite quarter every three months, and tapping continuously on half of the circumference with tapping on the opposite side every three months.

Increased yield of turpentine and rosin from double chipping, A. W. Schorger and R. L. Pettigrew (*U. S. Dept. Agr. Bul. 567* (*1917*), *pp. 9, pls. 2*).—This bulletin gives the results for one season of experiments under way at Columbia, Miss., in which standard, narrow, and double chipping are being compared.

As a result of the first year's operation upon virgin timber double chipping produced 31 per cent more turpentine and 36 per cent more rosin than standard chipping. The net gain from double chipping was about $450 per crop of 10,000 faces. The height of the face at the end of the season was approximately the same as that of the standard face. Narrow chipping produced 17.5 per cent less turpentine and rosin than standard chipping and the faces were only half as high as the standard faces at the end of the season.

Developments in the marking of western white pine (Pinus monticola) in northern Idaho, C. K. McHarg, J. Kittredge, J. F. Preston, et al. (*Jour. Forestry, 15* (*1917*), *No. 7, pp. 871–885*).—This article describes the new marking rules for the white pine type on the Cœur d'Alene Forest. The work of preparing the rules was conducted under the direction of the Office of Silviculture of the Forest Service of the U. S. Department of Agriculture during 1915–16.

A practical xylometer, J. S. Illick (*Jour. Forestry, 15* (*1917*), *No. 7, pp. 859–863, figs. 2*).—An xylometer used by the author during the past five years in connection with various forest investigations is here described and illustrated.

A simplified method of stem analysis, T. W. Dwight (*Jour. Forestry, 15* (*1917*), *No. 7, pp. 864–870*).—The author here outlines a method of stem analysis which, it is believed, will make possible a greater number of growth studies so as to determine to some extent at least the factors controlling variation in growth and the effect of those factors in various localities.

What is a basis for yield tax? F. Roth (*Jour. Forestry, 15* (*1917*), *No. 7, pp. 886–890*).—The author here presents and discusses a basis for determining the yield tax on wild woods. This provides for a universal yield tax of around 5 per cent on the assumption that the forest pay an equivalent of a property tax of $8 per $1,000 on full assessment.

The kiln drying of lumber, H. D. Tiemann (*Philadelphia and London: J. B. Lippincott Co., 1917, pp. XI+316, pls. 22, figs. 39*).—A practical and theoretical treatise, the successive chapters of which deal with the structure and properties of wood; common practices in drying; how wood dries, shrinkage, warping, and case-hardening; the principles of kiln drying; the circulation and the method of piling; special problems in drying; the improved water spray humidity regulated dry kiln; drying by superheated steam and at pressures other than atmospheric; theoretical considerations and calculations, humidity, evaporation, density, the drying cycle, amount of air and heat required, ther-

mal efficiency; effect of different methods of drying upon the strength and the hygroscopicity of wood; instruments useful in dry kiln work and methods of testing wood; temperatures and humidities for drying various kinds of lumber; and humidity diagram.

Appended to the work is a brief discussion of special woods for war uses.

DISEASES OF PLANTS.

Wind-blown rain a factor in disease dissemination, R. C. FAULWETTER (*U. S. Dept. Agr., Jour. Agr. Research, 10* (*1917*), *No. 12, pp. 639–648, fig. 1*).—In a contribution from the South Carolina Experiment Station, the author gives additional data relating to wind-blown rain as a factor in disease dissemination. In a previous publication (E. S. R., 37, p. 49) the results of field experiments were described, and in the present paper laboratory investigations are reported upon which were found to confirm previous conclusions.

It was found that water is splashed by a falling drop only when it falls upon a film of water, and that it is the water of the film which composes the splash drops. The distance of the splash varies according to the size of the drop, depth of surface films, elevation and inclination of surface of impact, and velocity of the wind. A drop of 0.02 cc. in volume falling 16 ft. upon a relatively thin film of water during a wind of 10 miles an hour, splashed water in abundance a distance of 8 ft., or across two rows of cotton, in moderate quantities as far as 12 ft., and in slight amounts to 16 ft.

In the investigation to determine the dissemination of disease in the presence of dew and heavy fogs without wind, it was found that drops from leaves, which are larger than the average rain drops, falling 12 in. upon a film of water will scatter splash drops over an area of 20 to 32 in. in diameter. This fact is believed to account readily for the local dissemination of a number of diseases.

Attention is called to the probability that wind-blown rain serves for the dissemination of a number of plant diseases.

[Plant diseases, 1914 to 1916], T. O. MORRISON ([*Bien.*] *Rpt. Dept. Agr. Wash., 2* (*1915–16*), *pp. 91–94*).—Pear blight, which has been destructive in parts of the State of Washington since 1910, is thought to be controllable, if not eradicable. Since 1914 apple mildew has been more threatening than previously, Jonathan being the most seriously affected of the commercial varieties. A test with iron sulphid, atomic sulphur, and milled sulphur practically controlled the disease and left the fruit buds in apparently good condition, though scorching followed the use of iron sulphid in some localities. In tests of dry sulphur, iron sulphid, milled sulphur, and atomic sulphur as used against grape mildew, the results from the last three were almost perfect.

A degree of success was attained in an attempt to combine effectiveness with cheapness in the control of aphids and ants (which were supposed to be responsible for a large proportion of summer spread of blight), this result being obtained by the use of Blackleaf 40 in combination with lime.

Biologic forms of Puccinia graminis on cereals and grasses, E. C. STAKMAN and F. J. PIEMEISEL (*U. S. Dept. Agr., Jour. Agr. Research, 10* (*1917*), *No. 9, pp. 429–496, pls. 7*).—In a contribution from the Minnesota Experiment Station, the authors give an account of inoculation experiments in cooperation with the Bureau of Plant Industry with *P. graminis* collected from about 30 species of grasses in the upper Mississippi Valley, part of the northern Great Plains region, and a small area of the Pacific Northwest.

As a result of the inoculation experiments, a number of biologic forms were found, which, on the basis of their parasitism, may be divided into two

groups, the first consisting of *P. graminis tritici*, *P. graminis tritici compacti*, and *P. graminis secalis;* the second of *P. graminis avenæ*, *P. graminis phleipratensis*, and *P. graminis agrostis*. For group 1, wheat, club wheat, rye, and *Agropyron repens* are said to be differential hosts; while for group 2, oats, *Phleum pratense*, and *Agrostis* spp. serve a similar purpose. Barley, rye, and *Bromus tectorum* have been found infected by all six biologic forms, and oats is reported as being infected by all but *P. graminis tritici compacti*. The biologic forms are said to be distinguished from each other morphologically as well as parasitically.

Some notes are given on observations on the overwintering of the uredinial stage on grass hosts, but definite conclusions have not been reached, except for *P. graminis phleipratensis*, which survived the severe winter of 1916–17 at St. Paul, Minn.

Some diseases of wheat crops and their treatments, W. J. Spafford (*Jour. Dept. Agr. So. Aust., 20 (1917), No. 7, pp. 531–548*).—It is stated that of the smuts in South Australia, *Tilletia tritici* is by far the worst, loose smut (*Ustilago tritici*) is fairly common (doing but little damage), and flag smut (*Urocystis tritici*) somewhat reduces the wheat crop. Of other diseases, take-all (*Ophiobolus graminis*) is becoming increasingly troublesome in many districts, and red rust (*Puccinia graminis*) does not use the barberry as alternate host in Australia, being carried over the winter supposedly on some native grasses. Mildew (*Erysiphe graminis*) is becoming more or less common in wheat fields, where it is thought it may develop into a serious pest under the conditions prevalent in this region.

Some important diseases of truck crops in Florida, C. D. Sherbakoff (*Florida Sta. Bul. 139 (1917), pp. 191–277, figs. 38*).—The author gives descriptions of the more important diseases affecting different truck crops in Florida and offers suggestions for their control.

Common diseases of beans and peas, M. T. Cook (*New Jersey Stas. Circ. 84 (1917), pp. 2–8, figs. 4*).—This is in part a revision of Circular 50, previously noted (E. S. R., 35, p. 245).

Toxic chlorosis of maize, P. Mazé (*Compt. Rend. Soc. Biol. [Paris], 79 (1916), No. 19, pp. 1059–1066*).—In the course of a study of chlorosis of maize, as previously noted (E. S. R., 33, p. 522), the author has found that a form of chlorosis different from that caused by a lack of sulphur and of iron can be produced experimentally, being due to a sort of intoxication of the plant. On the other hand, cell sap from the normal leaves, when deposited on the etiolated leaves, causes a return of the normal green color in the cells. This curative property of normal juices may disappear for a time under the influence of certain atmospheric conditions. This restorative substance is thought to be elaborated by protoplasmic activity which may produce an internal secretion, the function of which is to guard the plant against accidental intoxications and parasitic diseases.

It was found that the addition of lead or of methyl alcohol to a nutritive solution which is described, or the removal of zinc therefrom, would cause a toxic chlorosis of maize which was relieved by applying to the etiolated cells an exudate of normal leaves or an extract of the crushed leaves. The parenchymal cells of normal leaves of maize are thought to secrete a substance which may prevent the intoxication due to any of several causes, and which may prevent also attack by parasitic insects.

Studies in the mosaic diseases of plants, G. W. Freiberg (*Ann. Missouri Bot. Gard., 4 (1917), No. 2, pp. 175–232, pls. 4*).—Summarizing the evidence presented in this paper and by other workers on mosaic diseases, the author states that these are not caused by unbalanced inorganic nutrition, inorganic

elements being present in about the same proportion in diseased as in healthy tissue. Carbodydrates are more abundant in dark green than in light areas. Proteins are apparently present more abundantly in the lighter than in the darker areas.

The physiological phase of the disease is thought to be a very important one. Preliminary observations appear to show the existence of minimum, optimum, and maximum points as regards temperatures favoring the disease, the check from unfavorable temperatures suggesting the recovery of the plant.

The infective principle is thought to be an enzym different in character from that giving the guaiacum reaction. Like all colloidal compounds, including enzyms, it is greatly absorbed by talc. There is a specificity of reaction between the infective principle or mosaic enzym and formaldehyde (if not aldehydes in general) which is not observable in case of concentrated antiseptics of other kinds. The infectious properties are, however, destroyed by alcohol in concentrations destructive to enzyms, and by temperatures which inactivate enzyms or hydrolyze some organic compounds, cooling having no greater effect than is exerted on any chemical compound, including enzyms. The reproduction of the mosaic enzym can be accounted for on physiological grounds, but the original factors are unknown.

The above facts and the fact that formaldehyde is one of the first products of photosynthesis suggest a basis for the possible explanation of the physiological aspects of mosaic diseases. The continued production of the mosaic enzym is considered to be in accordance with the fundamental principles of pathology and physiology.

Further studies of the mosaic disease of tobacco, H. A. Allard (*U. S. Dept. Agr., Jour. Agr. Research, 10 (1917), No. 12, pp. 615–632, pl. 1*).—In continuation of the author's studies of the mosaic disease of tobacco (E. S. R., 36, p. 647), an account is given of an investigation of the susceptibility of tobacco plants to infection through the trichomes, resistance to mosaic disease in tobacco plants, and the distribution of the virus in inoculated leaves.

It has been found that the virus of the mosaic disease of tobacco is present in the trichomes of the leaves, and the disease may be communicated to healthy plants by inoculating the virus into the trichomes alone. The infective principle does not readily invade uninjured trichomes or leaf tissues, but infection readily follows when the virus is sprayed upon the leaves and subsequently rubbed in. Cutting across the midrib at the base of the leaf or severing all the larger veins on one or both sides of the midrib did not prevent the final dissemination of the virus to other leaves and other portions of the plant.

Thorough steam sterilization of the soil of the seed bed was found to completely destroy any virus which may be present in the soil. Infection from diseased material in the soil appears to depend upon injury to some portion of the root system.

Nicotiana glauca has been found susceptible to the mosaic disease of tobacco, although visible symptoms of the disease may be very slight. The sap of such plants proved highly infectious to healthy plants of *N. tabacum.*

As carriers of the disease the author has found that the green peach aphis (*Myzus persicæ*) may become active in the greenhouse after feeding upon diseased plants, and the large plant louse (*Macrosiphum tabaci*) is an efficient carrier of the infective principle of the disease under field conditions. Red spiders gave negative results, and white flies did not appear actively concerned in the transmission of the disease.

The control of tobacco wilt in the flue-cured district, W. W. Garner, F. A. Wolf, and E. G. Moss (*U. S. Dept. Agr. Bul. 562 (1917), pp. 20, figs. 5*).—An account is given of investigations conducted cooperatively by the North Caro-

lina Experiment Station and this Department for the control of the tobacco wilt due to *Bacterium solanacearum.* This disease is widely distributed, having been first reported in North Carolina in 1903 and being known to occur in Sumatra, Java, and Japan.

Experiments have been carried on to determine whether the wilt can be controlled by a chemical or physical treatment of the soil, but without any encouraging results. Crop rotation has given satisfactory results, and it is recommended that this be practiced, infested land being planted to other crops for at least five years. In order to prevent the introduction of the wilt on farms not already infested, the authors recommend that seed beds be thoroughly sterilized by burning and that care be taken not to allow surface drainage from infested farms to reach seed beds or other tobacco lands.

Winter blight of the tomato, C. R. Orton and W. H. McKinney, jr. (*Pennsylvania Sta. Rpt. 1915, pp. 235–246, pls. 6*).—According to the authors, winter blight of tomatoes has caused considerable damage in certain sections of Pennsylvania where this crop is grown commercially under glass. The symptoms of the disease are described, the stems, leaves, flowers, and fruits being affected. It is said to spread quite rapidly through the greenhouse and seems to be carried by soil and insects and to be disseminated by contact.

Several theories have been advanced as to the cause of the disease, bacteria, species of fungi, and nonparasitic causes due to unfavorable soil conditions having been considered. Some work is being done on all these theories, and a light yellow and an orange-brown organism has been isolated quite constantly from diseased plants, but all attempts to reproduce the disease by inoculating plants with cultures of these organisms have been unsuccessful.

While the cause of the trouble is not definitely known, some experiments in control have been carried on in which resistant strains were tested and attempts made to prevent the disease by combating the white fly and by spraying with Bordeaux mixture and other fungicides. Promising results were obtained in the test of resistant strains and the white fly control experiments, but spraying with fungicides is said to have given negative results. Suggestions for the prevention of the disease include the selection of healthy plants; sterilization of seed; frequent renewal of seed beds; proper attention to ventilation, watering, etc.; and control of the white fly.

Common diseases of apples, pears, and quinces, M. T. Cook (*New Jersey Stas. Circ. 80 (1917), pp. 27, figs. 23*).—This is a revision of Circular 44, previously noted (E. S. R., 33, p. 349).

Common diseases of the peach, plum, and cherry, M. T. Cook (*New Jersey Stas. Circ. 81 (1917), pp. 3–19, figs. 11*).—This is a revised edition of Circular 45, previously noted (E. S. R., 33, p. 349).

Diseases of stone fruits, J. Chifflot (*Pomol. Franc., No. 1 (1917), pp. 27–32*).—It is stated that among numerous fungus attacks of stone fruits in the region of the Rhone Valley very serious damage is done by *Exoascus deformans*, *Coryneum beyerinckii*, *Monilia cinerea*, and *M. laxa*, particularly the last two named.

Note on Dr. J. Smolák's paper, A Contribution to our Knowledge of Silverleaf Disease, F. T. Brooks (*Ann. Appl. Biol., 2 (1916), No. 4, pp. 228, 229*).—Referring to a discussion of his previous communication (E. S. R., 29, p. 847) appearing in the paper by Smolák (E. S. R., 34, p. 648), the author emphasizes his previous statement that *Stereum purpureum* is probably not the only organism concerned in the production of silver-leaf disease.

Raspberry diseases in Minnesota, G. R. Hoerner (*Minn. Hort., 45 (1917), No. 6, pp. 236–243, figs. 3*).—Brief description and discussion are given of gray bark, or spur blight, anthracnose, crown gall, and yellows or curly leaf, which

are said to comprise the list of the more important raspberry diseases in Minnesota.

Grape downy mildew in 1916 at Montpelier, L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 38 (1917), No. 18, pp. 413–415, fig. 1*).—A study of the numbers and the locations of new cases of grape downy mildew of the second and third outbreak has shown that such outbreaks arise from previous centers of mildew attack, that the number of cases decreases with the distance from the former center, and that the total number of cases increases greatly with the successive outbreaks. The facts as observed and mapped are thought to explain the presence of uninfected areas along with other areas seriously affected, also the relative or exceptional apparent immunity of certain early or late varieties which are mentioned.

Iron in copper sprays for chlorosis, A. DONNADIEU (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 37 (1916), No. 34, pp. 176, 177*).—The author relates experiences claimed to show that the addition of 0.1 per cent iron sulphate to an acid (in the case cited, a commercial) copper spray prevents or cures chlorosis in vines subject thereto. The iron compound serves also as a fixative for the copper in sprays employed for downy mildew.

Wood rot of citrus trees, J. A. STEVENSON (*Porto Rico Dept. Agr. Expt. Sta. Circ. 10 (1917), pp. 10; Spanish ed., pp. 10*).—A popular description is given of wood rot due to the attacks of a number of species of fungi, with suggestions for the control of the injury by pruning and protecting the wounds from infection.

Fungus diseases of coffee, R. AVERNA-SACCÁ (*Bol. Agr. [Sao Paulo], 17. ser., 1916, Nos. 10, pp. 790–840, figs. 49; 11, pp. 878–922, figs. 46*).—Descriptive discussions are given of cryptogamic diseases of coffee, including *Dematophora necatrix*, *Hysterium coffeanum*, *Peziza* (?) *coffeicola*, *Capnodium brasiliense*, *Pseudodiaporthe coffeæ*, *Euryachora coffeicola*, *Scutellum* (?) *coffeanum*, *Eutypa lutibunda coffeicola*, *Rhapidospora coffeicola*, *Didymosphæria coffeicola*, *Sphærella coffeicola*, *Anthostomella coffeæ*, *Leptosphæria coffcigena*, *Venturia coffeicola*, *Oraniella coffeicola*, *Fusarium pallens*, *Periconia göldeniana*, *Macrosporium coffeanum*, *Cercospora coffeicola*, *Glœosporium coffeanum*, *Colletotrichum coffeanum*, *C. coffeæ*, *C. incarnatum*, *Dendrophoma coffeicola*, *Phyllosticta coffeicola*, *Rhabdospora coffeæ*, *Hendersonia coffeæ*, *Discosia theæ*, *Fusarium coffeicola*, *Coniothyrium coffeæ*, *Diplodia coffeicola*, *Macrophoma coffeæ*, *Schizophyllum commune*, *Micena* (?) sp., and *Physcia integrata sorechiosa*.

Tylenchus acutocaudatus in coffee trees, R. G. DE SOUZA (*Bol. Agr. [Sao Paulo], 17. ser., 1916, Nos. 9, pp. 726–736, figs. 7; 11, pp. 873–878, figs. 3*).—This is a brief account of the mode of attack and the serious damage done to coffee plants by the nematode *T. acutocaudatus*, which is found in the roots but in none of the aerial portions.

Wilt or crown-rot disease of carnations caused by Fusarium sp., P. A. VAN DER BIJL (*Ann. Appl. Biol., 2 (1916), No. 4, pp. 267–291, pls. 4*).—The author, giving an account of a disease characterized by a wet stem rot and leaf abnormality, states that the trouble is due to a Fusarium, which is discussed. Experiments looking to the control of the disease were ineffective in case of formalin applied to the soil, but quicklime showed some improvement. Preventive measures include rotation and the use of cuttings and of soil known to be free from infection.

Carnation yellows, G. L. PELTIER (*Proc. Amer. Carnation Soc., 25 (1916), pp. 29–35*).—This is an account, with some discussion, of recent work done on carnation yellows, the cause of which remains unknown, although three forms are here discussed.

Seedlings rarely show yellows, though cuttings propagated from seedling plants for two years invariably show that condition, owing presumably to

infection at the cutting bench and to an early breaking down of some sort in the tissue, which later develops into yellows. Overpropagation may also favor yellows by lowering the vitality of the cuttings. Of cuttings, layers, and shoots taken from apparently healthy seedlings and grafted on stock which was badly diseased, the first two showed little if any indication of yellows, while the grafted stock yellowed badly, leaving but little doubt that the disease can be communicated to healthy plants by grafting.

Some factors influencing the prevalence of Endothia gyrosa, N. E. STEVENS (*Bul. Torrey Bot. Club, 44 (1917), No. 3, pp. 127–144, figs. 5*).—In pursuance of the work previously noted with *E. parasitica* (E. S. R., 37, p. 557), the author states that the distribution of the American species of Endothia does not coincide with that of their hosts. The present paper deals with *E. gyrosa*, said to have a much wider range in America than any other species of this genus and to be indigenous here with a long history as indicated. It is, however, abundant only in the Southeastern States.

Inoculation experiments during 1914 and 1915 have shown that this fungus can grow and overwinter beyond the northeastern limits of its present known range, and have emphasized the importance of water supply and of the condition of the host in relation to the growth of the fungus. It thrives best on injured tissue which remains moist for a time, as cut limbs or injured roots. The temperature of the Southern States is more favorable to the fungus than is that of the Northern States, the division line between regions of its rarity or its abundance being fairly definite, this fact suggesting some significant factors other than climate. The chief of these appears to be increased opportunity for infection in the Southern States, due to the increase there in number and relative importance of its host plants and to the increased opportunity for infection due to soil and cultural conditions causing greater erosion and consequently more frequent exposure of the roots of Fagus and Quercus to injury and infection.

[Chestnut bark disease], H. METCALF (*North. Nut Growers Assoc. Proc., 7 (1916), pp. 41–54*).—It is stated that during the first year or more of its life the chestnut (even in the case of sprouts growing from diseased stock) is immune to attack by the chestnut bark fungus. No evidence has been obtained, however, that the disease is stopping naturally anywhere in its progress, which is now very widespread. Cutting out affected parts of trees which have been attacked is effective but too expensive to be profitable. No immune native trees have been found, but some Asiatic chestnuts appear to be more or less resistant.

[Diseases of the English walnut], S. M. McMURRAN (*North. Nut Growers Assoc. Proc., 7 (1916), pp. 67–79*).—In this discussion, which also referred to the so-called winterkilling and to other more or less obscure troubles of walnut trees, it was stated that walnut blight has been found at a number of points in New Jersey, Delaware, and Pennsylvania, leading to the view that the disease has been present in this section for a long time. It is apparently less actively pathogenic here than in California (where spraying has not proved economical), but it is thought that selective breeding for resistant forms will prove to be the most effective measure looking to its control.

Observations on some diseases of plantation rubber in Malaya, F. T. BROOKS (*Ann. Appl. Biol., 2 (1916), No. 4, pp. 209–227, pls. 3*).—This is an account of observations on diseases of plantation rubber during 1914, some of which have already been published (E. S. R., 34, pp. 57, 448). The several sections of this article deal with *Fomes lignosus*, *Polyporus rugulosus*, *Sphærostilbe repens*, *Hymenochæte noxia*, *Ustulina zonata*, *Botryodiplodia theobromæ*, bark diseases, burs, thread blight associated with *Cyphella heveæ* and perhaps

other fungi, *Phyllosticta ramicola*, *Glœosporium alborubrum*, a species of Cephaleuros, and two or more of Loranthus.

Diseases of Hevea brasiliensis, G. Bryce (*Dept. Agr. Ceylon Bul. 29* (*1916*), *pp. 10*).—This bulletin gives the principal facts regarding diseases of Hevea, including *Fomes lignosus* (*F. semitostus*), brown root disease (*Hymenochæte noxia*), pink disease (*Corticium salmonicolor*), Diplodia disease and dieback (*Botryodiplodia theobromæ*), and the four diseases caused by *Phytophthora faberi*, stem canker, abnormal leaf fall, pod disease, and bark rot of the tapping surface.

A nursery blight of cedars, G. G. Hahn, C. Hartley, and R. G. Pierce (*U. S. Dept. Agr., Jour. Agr. Research, 10* (*1917*), *No. 10, pp. 533–540, pls. 2*).—The authors give a description of a disease of hitherto unknown origin which has for several years been known to cause great losses to growers of cedars in a number of nurseries. The disease is believed to attack primarily young plants, trees over four years old being seldom affected under nursery conditions.

A species of Phoma has been isolated from infected plants, and the parasitism of the fungus has been proved on two and three year old plants of six species of Juniperus, three species of Thuja, and one species of Cupressus.

Spraying with commercial lime-sulphur solution and Bordeaux mixture has given little indication of their availability for the control of the disease.

White pine blister rust, F. W. Rane (*Ann. Rpt. State Forester Mass., 13* (*1916*), *pp. 15–19*).—It is stated that infection with white pine blister rust on Ribes was general over most of the State, indicating the spread during 1916 of the disease in the summer spore stage on currants and gooseberries. A light infection appeared on pine, but this was confined to foreign stock (probably diseased when planted) or to native pines which had stood near currants or gooseberries for many years. The progress on pine has been slow and the actual loss from this cause very slight.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The moose book, S. Merrill (*New York: E. P. Dutton & Co.* [*1916*], *pp. XII+366, pls. 25, figs. 32*).—This popular work deals first with the American moose (pp. 1–268) and then with the Old World elk (pp. 269–355.)

Trapping moles and utilizing their skins, with especial reference to the Pacific coast States, T. H. Scheffer (*U. S. Dept. Agr., Farmers' Bul. 832* (*1917*), *pp. 13, figs. 11*).—An account of the best methods of trapping moles in the Pacific coast States, but, with modifications, applicable to all localities where moles are found.

The pack rat as an enemy of natural reproduction on the Angeles National Forest, E. N. Munns (*Jour. Forestry, 15* (*1917*), *No. 4, pp. 417–423*).—*Neotoma fuscipes mohajensis* is said to be destructive to Jeffrey pine (*Pinus jeffreyi*) by girdling the main stems of the trees.

Holden's new book on birds, G. H. Holden (*New York: Author, 1917, pp. 133, figs. 28*).—A small handbook dealing with the food, care, breeding, diseases, and treatment of house birds.

Birds worth knowing, N. Blanchan (*Garden City, N. Y.: Doubleday, Page & Co., 1917, pp. XII+257, pls. 48*).—A popular account.

The bird study book, T. G. Pearson (*Garden City, N. Y.: Doubleday, Page & Co., 1917, pp. XV+258, pls. 17, figs. 26*).—A popular work.

How to attract birds in the Middle Atlantic States, W. L. McAtee (*U. S. Dept. Agr., Farmers' Bul. 844* (*1917*), *pp. 15, figs. 11*).—This is the third of a series of publications (E. S. R., 36, p. 151) which describe the best methods of

attracting birds about homes in the various parts of the United States, especially by providing a food supply and other accessories about the homestead.

The natural enemies of birds, E. H. Forbush (*Mass. Bd. Agr., Econ. Biol. Bul. 3 (1916), pp. 58, pls. 7, figs. 5*).—This is a discussion of the more important natural enemies of birds, particularly in Massachusetts.

Insect pests in the West Indies in 1916 (*Agr. News [Barbados], 16 (1917), No. 392, pp. 138, 139*).—This consists of brief notes on the more important insects of the year.

A naturalist in Borneo, R. W. C. Shelford, edited by E. B. Poulton (*London: T. Fisher Unwin, Ltd., 1916, pp. XXVII+331, pls. 32*).—This work includes observations of insects of economic importance.

How to detect outbreaks of insects and save the grain crops, W. R. Walton (*U. S. Dept. Agr., Farmers' Bul. 835 (1917), pp. 24, figs. 15*).—This popular account deals with the Hessian fly, chinch bug, army worm, cutworms, grasshoppers, white grubs, billbugs, corn root aphis, wireworms, etc.

Some common garden insects, J. Troop and P. W. Mason (*Indiana Sta. Circ. 64 (1917), pp. 15, figs. 9*).—A popular summary of information.

Control of some garden insects, L. B. Smith (*Virginia Truck Sta. Bul. 23 (1917), pp. 489–506, figs. 9*).—A summary of control measures for some of the more common insects attacking vegetables.

Entomological notes, B. C. Burt (*Rpt. Cawnpore [India] Agr. Sta., 1916, pp. 35–41*).—These notes consist of records kept during the cotton-growing season of various bollworms attacking cotton and bhindi. A table is given showing the relative numbers of *Earias fabia* and *E. insulana* and the Rhogas parasite. Notes on other cotton pests are included.

Insects attacking cotton and their enemies, F. Iglesias (*Bol. Agr. [Sao Paulo], 17. ser., No. 12 (1916), pp. 968–998, figs. 35*).—A summarized account is given of the more important insects attacking cotton in Brazil and their natural enemies, particularly *Gasterocercodes gossypii*, a weevil which attacks the rootstalks previously described by Pierce (E. S. R., 32, p. 658), and the cotton leaf worm.

Insects attacking hemp, P. Noel (*Bul. Lab. Régional Ent. Agr. [Rouen], No. 1 (1917), pp. 11, 12; abs. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 4, p. 159*).—A list is given of hemp insects.

Insect enemies of maize, P. Noel (*Bul. Lab. Régional Ent. Agr. [Rouen], No. 1 (1917), pp. 6–10; abs. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 4, p. 159*).—A list is given of the insect enemies of corn.

The behavior of some soil insects in gradients of evaporating power of air, carbon dioxid, and ammonia, C. C. Hamilton (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 32 (1917), No. 3, pp. 159–182, figs. 5*).—This is a report of studies made with a view to determining the behavior of some soil insects in evaporation, carbon dioxid, and ammonia gradients under experimental conditions.

Arsenical residues after spraying, W. C. O'Kane, C. H. Hadley, jr., and W. A. Osgood (*New Hampshire Sta. Bul. 183 (1917), pp. 62, figs. 14*).—The results of investigations from 1912 to 1916 are here reported. Data on the amounts of arsenical remaining on fruit and vegetables after spraying with arsenate of lead are followed by a discussion of the toxic standards and the possible danger of human poisoning, the results of feeding lead arsenate and white arsenic to guinea pigs, and the effect of the drip from sprayed trees on calves, sheep, and poultry.

On apples from 10 trees picked at intervals ranging from 5 to 90 days after spraying the residues were as follows: Carefully picked fruit 0.08 to 0.77 mg.; picked in the ordinary way, 0.02 to 0.5 mg.; picked with cotton gloves, 0.1 to

0.21 mg.; picked with cotton gloves and wiped, 0.08 to 0.18 mg. Rain and weather had considerable influence; when picked in the ordinary manner the residue per fruit decreased 75 per cent when fruit remained 75 to 91 days on the trees as compared with fruit picked 3 to 5 days after spraying. Four mg. of As_2O_3 was found to be the maximum amount that will adhere to the fruit. With small fruits and vegetables picked before and after rains the amount of residue recovered ranged as follows: Strawberries from 8.6 to 34.2 mg. per quart, currants from 6.8 to 10.2 mg. per quart, blackberries from 3.8 to 11.2 mg. per quart, cabbage from 43.5 to 51.4 mg. per head and lettuce from 1.6 to 10.6 mg. per head, the outer leaves being included.

It is pointed out that the standard medicinal dose of arsenic (As_2O_3) is from 2 to 5 mg. and the dangerous dose, 60 to 120 mg. Cooperative experiments carried out at the University of Chicago have shown lead arsenate to be somewhat soluble in human gastric juice, but probably less so than white arsenic (As_2O_3).

The results of feeding lead arsenate and white arsenic to guinea pigs are reported.

The evidence presented indicates that under ordinary conditions no apples will reach the consumer carrying such amounts of lead arsenate per fruit as will cause fatal poisoning in a healthy human adult. Strawberries should not be directly sprayed with lead arsenate after they have fully formed, nor should blackberries after they have formed, and currants if so sprayed should be washed. With cabbage and lettuce ready for market arsenate of lead should not be applied except sparingly, and in that event the outer leaves should be removed and the heads washed.

In experiments to test the effect of the drip from sprayed trees on live stock it was found that average drip from trees amounted to 11.2 per cent where the spray material was applied with reasonable care. Calves were confined to plats of grass carrying spray material directly applied at concentrations of 3, 6, and 10 lbs. of lead arsenate paste to 50 gal. of water. Calves pastured on 7 successive plats sprayed at the rate of 3 lbs. to 50 gal. of water were not seriously poisoned but failed to gain weight and showed some minor effects. Those pastured on grass sprayed at concentrations of 6:50 developed definite symptoms of serious poisoning, but when removed to grass containing no poison they fully recovered. Two calves pastured on grass carrying concentrations of 10:50 developed serious poisoning and one died, but the other recovered when removed to grass containing no poison.

Sheep were pastured on grass containing similar amounts of lead arsenate. Those which consumed grass on 10 successive plats carrying arsenate of lead at concentrations of 3:50 gave no evidence of serious poisoning; those which consumed grass on the 6:50 plats developed serious symptoms but fully recovered on removal to unsprayed grass; those on the 10:50 plats gave evidence of serious poisoning, one dying, but another recovering after removal to grass free from poison. Sheep pastured within a pen beneath sprayed trees showed no evidence of serious poisoning when the spray material was used at the rate of 3:50 or 6:50, even though large amounts of spray were applied, but when the application was at the rate of 10:50 they showed definite symptoms but recovered.

Hens and young chicks confined in pens and pastured on grass carrying arsenate of lead at concentrations of 3, 6, and 10 lbs. to 50 gal. of water developed no symptoms of serious poisoning, although fed on 10 successive plats within a period of 56 days.

Quassia extract as a contact insecticide, N. E. McIndoo and A. F. Sievers (*U. S. Dept. Agr., Jour. Agr. Research, 10 (1917), No. 10, pp. 497–531, figs. 3*).—

Following a historical review of the literature dealing with quassia and quassiin, and with quassia extract as an insecticide, the authors report investigations conducted with a view to determining (1) the efficiency of various extracts of quassia wood, and (2) the pharmacological effects of these extracts upon insects.

"The exhalations alone from the quassiin powder killed aphids, but the exhalations from quassia chips, quassia powder, and those from solutions containing quassiin extract and quassia extract were ineffective. Quassia powder dusted upon insects is ineffective, while quassiin powder is quite effective, indicating that the exhalations pass into the respiratory system and that they then affect the nervous system. The minutest particles of either powder are sufficiently small to pass into the spiracles, but they do not cause death by closing the entrances of the tracheæ.

"Quassia and quassiin spray solutions, not containing soap, kill aphids when applied sufficiently strong. By the process of elimination it is concluded that death occurs as a result of some of the fine spray being breathed into the respiratory system while the aphids are being sprayed. The greater effectiveness of solutions containing soap is due to the weaker surface tension of such solutions, which pass freely through the spiracles and finally reach the nervous tissue, where they kill by slowly affecting the nerve cells."

It was found that unlike nicotin, which acts quickly and causes pronounced symptoms, quassiin acts very slowly and causes but few symptoms and these are never pronounced. It is concluded that owing to the poor insecticidal properties of quassiin, quassia extract can never become a general insecticide for all aphids. Although the amount of extract to be used can be sufficiently increased so that the spray solution will perhaps be efficient on any particular aphid, in most cases the expense will prohibit its use. The most effective formula used was prepared by soaking 22 lbs. of quassia chips in 100 gal. of fish-oil solution (1.6 lbs. of soap to 100 gal. of water) for 24 hours.

A list of 48 references to the literature is included.

How to test for the presence of nicotin on sprayed plants, V. I. SAFRO (*Jour. Econ. Ent., 10 (1917), No. 5, pp. 459–461*).—The test recommended by the author is made by thoroughly rinsing a number of sprayed leaves with a minimum amount of distilled water, then filtering, and acidulating the filtrate with a few drops of hydrochloric acid. If a precipitate is formed at this point the filtration should be repeated and to the resulting filtrate several drops of 1 per cent silicotungstic acid should be added, when a white cloud will denote the presence of nicotin.

"This test has been applied successfully to aqueous solutions of 'free' nicotin, nicotin sulphate solutions, nicotin soap solutions, nicotin-arsenate of lead, and nicotin Bordeaux. It has not been found effective in testing nicotin lime-sulphur, as the presence of colloidal sulphur derived from the polysulphids seems to interfere with the test."

Rules and regulations for carrying out the provisions of the Insecticide Act of 1910 (*U. S. Dept. Agr., Office Sec. Circ. 34, 2. rev. (1917), pp. 15*).—The text of the Insecticide Act of 1910 (E. S. R., 24, p. 361) and the rules and regulations, as amended to August 3, 1917, are here given.

Gomphus parvidens, a new species of dragon fly from Maryland, BERTHA P. CURRIE (*Proc. U. S. Nat. Mus., 53 (1917), pp. 223–226, pls. 2*).

An asymmetrical bird louse found on three different species of troupials, J. H. PAINE (*Proc. U. S. Nat. Mus., 53 (1917), pp. 231, 232, pl. 1*).

The European earwig and its control, D. W. JONES (*U. S. Dept. Agr. Bul. 566 (1917), pp. 12, figs. 8*).—This is a report of investigations made of *Forficula*

auricularia at Newport, R. I., during the summer and fall of 1915 and the entire season of 1916. A brief account of this pest by Glaser has previously been noted (E. S. R., 32, p. 247). This earwig, first noted at Newport in 1911, where it is supposed to have been introduced on nursery stock from Europe, has increased so rapidly as to become a serious pest and cause much annoyance. By 1916 about 10 square miles had become heavily infested, and many new small colonies were found outside of this area. Mention is also made of a smaller colony reported from Seattle, Wash., in 1915, which had increased rapidly. Although found all over Europe, it seldom occurs there in great numbers.

Eggs have been observed to be deposited in the ground in November and December to the number of 50 to 90. The young earwigs, or larvæ, may be found in the ground or at night on the soil surface about May 5. They feed on very tender green shoots, such as clover and grass, and possibly portions of grass roots. Later they feed extensively on green shoots, such as Lima beans or dahlia plants. When the dahlia buds begin to appear and the blossoms of sweet william and early roses plentiful, they are damaged by the young earwigs, which feed on the bases of the petals and stamens. After passing through four larval stages they become adult about July 18 The adults feed almost entirely on the petals and stamens of flowers, although many other kinds of food, such as clover, grass, and terminal buds of chrysanthemums and other fall flowers are eaten. They also kill and eat certain unprotected, sluggish larvæ, dead flies, and the dead or dying of their own species. In late summer the adults congregate in large numbers in crevices or behind vines near a good food supply. The males seldom live over winter, but the females hibernate successfully in the ground from 2 to 8 in. below the surface. In 1916 they emerged from hibernation quarters the last week in April.

The most important natural enemy appears to be the nematode *Filaria locustæ*, which caused the death of approximately 10 per cent of the larvæ kept under close observation in the laboratory. Insecticidal and trapping control work here reported led to the recommendation that from May 15 to June 15 poisoned bread bait be broadcasted over the lawns and gardens just before dark, followed by one or more additional applications at intervals of three or four nights and that plants which show signs of having been eaten be sprayed with arsenate of lead, 6 lbs. to 50 gal. of water. After July 1, when necessary, a contact spray should be applied at night, covering the insects well as they crawl over the grass and plants and repeated every three nights until the numbers are sufficiently reduced. As a supplement the injection of contact sprays into cracks and crevices where earwigs commonly hide through the day should be made every other day. The author recommends that traps be placed every 10 or 12 ft. along borders or near vines and the earwigs removed therefrom each day by shaking the excelsior over a pail of kerosene and water.

Preliminary trials with the cacao thrips fungus (*Agr. News [Barbados], 16 (1917), No. 389, p. 94*).—A brief statement of the parasitism of thrips by *Sporotrichum globuliferum*.

Injury by tarnished plant bugs to the vine, L. Fulmek (*Ztschr. Pflanzenkrank., 26 (1916), No. 6–7, pp. 323–329, figs. 7*).—This paper deals with *Lygus spinolæ*, which was the source of great injury to the vine at San Michele, south Tyrol, and at Ligist, Steiermark, and *L. pratensis* at Krottendorf.

Report on further investigations on the capsids which attack apples, J. C. F. Fryer and F. R. Petherbridge (*Jour. Bd. Agr. [London], 24 (1917), No. 1, pp. 33–44, pl. 1*).—Further investigations (E. S. R., 35, p. 464) show that

nicotin, even when highly diluted, is fatal to and the best insecticide for use in combating capsid bugs which injure apples in England, of which the green bug (*Plesiocoris rugicollis*) is the most important. It is pointed out that nicotin may be applied in conjunction with soap, lime-sulphur, or Bordeaux.

Miscible oil v. fish-oil soap sprays for the control of Florida aleyrodids, E. A. Back and S. S. Crossman (*Jour. Econ. Ent., 10 (1917), No. 5, pp. 453–458*).—The spraying investigations here reported show miscible oil sprays to have a very practical advantage over fish-oil soap sprays. The importance of spraying citrus groves while the average number of aleyrodids per leaf is still small is emphasized.

Control work with phylloxera in Teramo from 1901 to 1916, B. Grassi (*Bol. Min. Agr. e Indus., Com. ed. Lavoro [Rome], Ser. B, 15 (1916), II, No. 9–12, pp. 69–135, pls. 3, figs. 11*).—A detailed report of control work.

The secondary host of Myzus cerasi, W. A. Ross (*Canad. Ent., 49 (1917), No. 12, p. 434*).—The author's observations have led to the conclusion that *M. cerasi* is partially monophagous and partially migratory.

"Apterous forms reside throughout the season on the primary host (cherry), and in addition alatæ produced during the summer migrate to and establish colonies on a secondary host. In Ontario, according to our observations, the favorite alternate host is wild peppergrass, *Lepidium apetalum*. We have made several collections of *M. cerasi* from this weed and in migratory tests we have repeatedly been successful in transferring the louse from the cherry to the wild peppergrass. No doubt other crucifers serve as summer hosts. In our insectary experiments we have succeeded in establishing colonies of *M. cerasi* on *Capsella bursa-pastoris*, *Brassica arvensis*, and *Erysimum cheiranthoides*, but so far these results have not been verified in the field."

The gipsy moth and the brown-tail moth and their control, A. F. Burgess (*U. S. Dept. Agr., Farmers' Bul. 845 (1917), pp. 28, figs. 14*).—A popular summary of information dealing with the present status of these pests and control measures.

The velvet bean caterpillar, J. C. Hutson (*Agr. News [Barbados], 16 (1917), No. 386, p. 42*).—This noctuid (*Anticarsia gemmatilis*), an account of which by Watson has been previously noted (E. S. R., 36, p. 459), is said to be the commonest of the leaf-eating caterpillars attacking several leguminous plants used generally throughout the West Indies as cover crops.

The coconut-tree caterpillar (Brassolis isthmia) of Panama, L. H. Dunn (*Proc. Med. Assoc. Isthmian Canal Zone, 9 (1916), pt. 1, pp. 32–48, pls. 5; Jour. Econ. Ent., 10 (1917), No. 5, pp. 473–488, pls. 2*).—This lepidopteran is said to be the most destructive insect enemy of the coconut tree (*Cocos nucifera*) in Panama. The caterpillars form long bag-shaped nests of the leaflets by fastening the ends together and spinning a silken lining on the inner side. They live in great numbers in these nests and feed upon the leaves, the average nest containing about 400 caterpillars, though as many as 2,000 may occur, The author's observations of the pests were made of the two annual generations for a period of two years.

The eggs are deposited during May and June and again the latter part of October, the whole of November, and the early part of December. They are deposited largely in masses of from 150 to 300 eggs on the lower side of the leaves or on the trunk of the coconut trees, but numbers are also found on buildings or other sheltered places. The incubation of the egg requires a period of from 25 to 30 days, the development of the larvæ about 4 months, and the transformation of the pupa from 14 to 17 days. They may be kept under complete control by removing the nests.

An account of this pest by Schultz has previously been noted (E. S. R., 21, p. 561).

The banana moth (Notarcha [Nacoleia] octasema) and its control, S. LEEFMANS (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Lab. Plantenziekten, No. 23 (1916), pp. 23, pls. 5*).—This report of investigations of the banana moth deals particularly with its biology and control measures.

The cranberry girdler (Crambus hortuellus), H. B. SCAMMELL (*U. S. Dept. Agr. Bul. 554 (1917), pp. 20, pls. 7*).—This is a report of biologic investigations of *C. hortuellus* and means for its control made in New Jersey throughout a period of nearly four years.

This crambid, originally described from Europe, occurs throughout the United States, Europe, and Canada, not being confined to cranberry-growing sections. It is very abundant in the cranberry-growing districts of Massachusetts and New Jersey and in the latter State especially the majority of the bogs show more or less injury by it. That it has not become a serious cranberry pest in Wisconsin is thought to be due to the fact that the bog floors are kept wetter than those in eastern cranberry States.

Its injury, which commences in early June and continues throughout the summer and fall until about mid-October, is caused by eating through the bark of the runners into the wood, often to such an extent that the runner is completely severed. The lessened vitality of such vines is evidenced by the foliage, which in September and October becomes fiery red or brown. Large quantities of the leaves drop off and the few which remain on completely girdled vines become dry and drop during the winter, leaving areas of dead vines, often as large as one-half acre, denuded of foliage.

Under dry bog conditions moths appeared from May 11 to June 18; when the winter flowage was removed on April 10 the moths began flying June 7, and when withdrawn on May 10, the adults were first noticed from June 10 to July 8. The eggs are so minute that it is impossible to find them under natural bog conditions. In rearing cages as many as 103 eggs were deposited in a single day, 243 being the greatest number laid by a single female, though Felt records as many as 700 (E. S. R., 6, p. 62). The incubation period of the egg varied from 6 days in August to 18 days in June.

C. hortuellus is one of the species of Crambinæ which defy all attempts to rear the larvæ, as previously noted by Ainslie (E. S. R., 35, p. 659), but the investigations demonstrated beyond doubt that there is only one generation annually in New Jersey. It was found that in New Jersey some larvæ form cocoons in late September and the majority in early October. Larvæ in cocoons are able successfully to withstand the usual winter flowage applied in December and held until the following April or May. Some few are able to withstand a flowage lasting until July, although an infestation is always greatly reduced by such late holding. The cocoon is not impervious to water and becomes filled with water about 3 days after submergence. Pupation occurs after the removal of the winter flowage and is dependent upon the time of this removal. On dry bogs it may occur in late April or May and on winter-flowed bogs it may be retarded by late holding of the flowage until July. After pupation has occurred the bogs may be reflowed for several days without effecting the death of the pupa. On one occasion a pupa in its cocoon was found alive on the bog after submergence for between 5 and 6 days. Records show that the pupal stage lasts 21 days on the average.

But few parasites attack the cranberry girdler, only two species of ichneumonids having been secured. Remedial measures mentioned include spraying, repellents, burning, trap lights, late holding of winter flowage, fall flooding, spring flooding, and sanding. Fall flooding immediately after picking the

crop, when this operation can be completed in time to apply the water before the last of September, has been found to be the most effective control measure. This treatment is effective in that it comes before the worms have spun their cocoons, and a reflow lasting not more than a week is undoubtedly of sufficient duration to kill all naked girdler larvæ.

"If the berries can not be removed from the vines in time to permit fall flooding before the last of September, or if the water supply is insufficient, the next best method of control is to hold the winter flowage over the vines until July 20, thereby losing one crop of berries, but gaining a clean bog and the possibility of having a crop twice the normal in quantity the following year. In the event that the foregoing remedies can not be employed, recourse may be had to sanding and better cultural methods."

A list of 12 references to the literature is appended.

A little-known cutworm, Euxoa excellens, A. Gibson (*Canad. Ent., 49 (1917), No. 12, pp. 401–403*).—A contribution to the knowledge of this cutworm, which in the Province of British Columbia has been abundant enough in certain years to effect important damage to vegetables of several kinds.

Apple and thorn skeletonizer (Hemerophila pariana), E. P. Felt (*Jour. Econ. Ent., 10 (1917), No. 5, p. 502*).—This yponomeutid is said to have become well established at Irvington, N. Y., ranging east to White Plains, and south to Scarsdale, and is reported as being present for a mile or two on the west bank of the Hudson. The caterpillar skeletonizes the upper surface of the leaf, usually drawing in a variable strip on each side about 0.5 in. wide and spinning a light web near the center of the leaf. Its work may be distinguished from that of the fall webworm by the absence of the enveloping web inclosing one or more leaves. The caterpillars are said to be easily destroyed by arsenicals as they feed upon the upper surface of the leaf.

Notes on the life history of Marmara elotella, a lepidopterous sap feeder in apple twigs, S. C. Vinal (*Jour. Econ. Ent., 10 (1917), No. 5, pp. 488–496, fig. 1*).—The life history studies here reported relate to a tineid (*M. elotella*) which forms serpentine mines in the bark of apple twigs and is prevalent at various points throughout Massachusetts. Its tunnels do not penetrate deep enough to injure the cambium and therefore it is of little economic importance. Similar mines thought to be caused by different species were observed by the author on poplar, ash, and pine.

An infestation of potatoes by a midge, Edith M. Patch (*Jour. Econ. Ent., 10 (1917), No. 5, pp. 472, 473, pl. 1*).—The mining of potato tubers at Roxie. Me., in 1913, by a chironomid of the genus Camptocladius is recorded.

An improved method of rearing tabanid larvæ, W. Marchand (*Jour. Econ. Ent., 10 (1917), No. 5, pp. 469–472*).—The author has found that the larvæ of a number of species of Tabanidæ, and probably of most of them, do not need earth or sand for their development. They can be kept very conveniently in test tubes laid out with a rolled-up sheet of filter paper somewhat less than the length of the test tube and filled with water to about 0.5 to 1 in. high, which is sufficient to keep the filter paper moist for a number of days. Meat proved to be an excellent substitute for earthworms as food.

The house fly, L. O. Howard and R. H. Hutchison (*U. S. Dept. Agr., Farmers' Bul. 851 (1917), pp. 23, figs. 15*).—This publication, which replaces Farmers' Bulletin 679, previously noted (E. S. R., 33, p. 455), gives a summary of information on the house fly, particularly as based upon recent investigations of the Bureau of Entomology (E. S. R., 33, p. 455; 34, p. 654).

Fly traps for camps, hospital precincts, and trench areas, A. Balfour (*Jour. Roy. Army Med. Corps, 27 (1916), No. 1, pp. 61–72, figs. 9*).—This dis-

cussion includes photographs of fly traps and a design for a fly trap for use in camp.

Hibernation of the house fly in Minnesota, C. W. Howard (*Jour. Econ. Ent., 10 (1917), No. 5, pp. 464–468*).—The observations here reported show that the temperature of Minnesota winters is not favorable to the overwintering of the house fly in any except the adult stage, and in that stage only in places where there is a sufficiently high temperature and where food conditions are favorable. A list of 13 references to the literature on the subject is included.

Key to the subfamilies of Anthomyidæ, J. R. Malloch (*Canad. Ent., 49 (1917), No. 12, pp. 406–408*).—Subfamily keys are presented for both males and females.

The food of Drosophila melanogaster, J. P. Baumberger (*Proc. Nat. Acad. Sci., 3 (1917), No. 2, pp. 122–126*).—The author's experiments show that yeast is the food of Drosophila larvæ. "The insect depends upon these cells for its proteins and has no greater synthetic power than is common to higher animals. Adult flies do not require proteins but survive for a much longer period on sugar agar than upon yeast agar. This difference between the nutritional requirements of larva and adult is probably due to the rapid growth in the former which requires proteins and leads to fatal changes in their absence."

The genus Calosoma, including studies on seasonal histories, habits, and economic importance of American species north of Mexico and of several introduced species, A. F. Burgess and C. W. Collins (*U. S. Dept. Agr. Bul. 417 (1917), pp. 124, pls. 19, figs. 5*).—The first part of this bulletin (pp. 1–16) gives a brief history of the genus Calosoma, a general seasonal history of species of the genus, the number of generations, food habits of adults and larvæ, the economic importance of the species of Calosoma, limits on the increase of the species, briefly describes an experiment to determine the climbing habits of Calosoma larvæ, gives a brief account of their natural enemies, and records methods of shipping and rearing Calosoma beetles.

The remainder of the bulletin (pp. 16–124), which relates to their classification, gives tables for determining adults and larvæ, describes 38 species of the genus, summarizes the present status of knowledge of their biology, and includes technical descriptions of their immature stages, so far as known, and a chronological bibliography for most of the species.

Scientific note on beetles causing damage to cotton in Yuma Valley, Ariz., E. A. McGregor (*Jour. Econ. Ent., 10 (1917), No. 5, p. 504*).—The loss of about 500 acres of cotton, replanted twice, on newly cleared land is said to have been due to *Myochrous longulus*. Investigations have shown that arrow weed (*Pluchea sericea*), which was abundant on the land the previous year, is probably the native host plant of this beetle, and that when the land was cleared they turned their attention to cotton.

A clerid larva predacious on codling moth larvæ, II, D. E. Merrill (*Jour. Econ. Ent., 10 (1917), No. 5, pp. 461–464*).—A record of further observations (E. S. R., 31, p. 353) of this predacious beetle (*Cymatodera æthiops*) in New Mexico.

The asparagus beetles and their control, F. H. Chittenden (*U. S. Dept. Agr., Farmers' Bul. 837 (1917), pp. 13, figs. 9*).—A revision of Bureau of Entomology Circular 102, previously noted (E. S. R., 20, p. 59).

Some weevils of the genus Diaprepes in the West Indies, J. C. Hutson (*Agr. News [Barbados], 16 (1917), No. 395, p. 186*).—These notes are based upon identifications of West Indies collections by W. D. Pierce. See also a previous note (E. S. R., 33, p. 360).

The tobacco beetle and how to prevent damage by it, G. A. Runner (*U. S. Dept. Agr., Farmers' Bul. 846 (1917), pp. 22, figs. 7*).—A summarized account

of the cigarette beetle (*Lasioderma serricorne*), its life history and habits, and control measures based upon investigations of the Bureau of Entomology.

The henequen curculionid (Scyphophorus acupunctatus) (*Bol. Dir. Agr. [Mex.], 2 (1916), No. 4, pp. 131–138*).—This is a summary of information on *S. acupunctatus*, which is the worst enemy of henequen or sisal in Yucatan, where it is commonly known by the name "max." The paper deals with its morphology, biology, economic importance, and control.

The coconut red weevil (Rhynchophora ferruginea), G. M. Henry (*Trop. Agr. [Ceylon], 48 (1917), No. 4, pp. 218, 219, pl. 1*).—This pest is widely spread and common in Ceylon wherever coconuts are grown.

The boll-weevil problem, with special reference to means of reducing damage, W. D. Hunter (*U. S. Dept. Agr., Farmers' Bul. 848 (1917), pp. 40, figs. 7*).—This summary of information includes the practical results of the more recent investigations.

Collection of weevils and infested squares as a means of control of the cotton boll weevil in the Mississippi Delta, B. R. Coad and T. F. McGehee (*U. S. Dept. Agr. Bul. 564 (1917), pp. 51, pls. 2, fig. 1*).—This is a report of a series of studies conducted in Mississippi and Louisiana during the seasons of 1915 and 1916, with a view to ascertaining the value of various methods of collecting boll weevils and infested cotton forms as a means of control for the cotton boll weevil, of which a report of the work in 1915 has been previously noted (E. S. R., 35, p. 554). Since the investigations in 1916 were conducted under seasonal and climatic conditions which differed considerably from those of 1915 and were more extensive, the combined results of the two seasons' investigations, here presented, are considered to be fairly conclusive.

The data are presented under the headings of the time interval between bag-and-hoop collections in relation to the proportion of infested forms secured, plat tests of the value of the bag-and-hoop as a means of weevil control under field conditions, and studies on the value of a mechanical collector of boll weevils.

In summarizing the work the author finds that two points in particular stand out in the results of the studies in 1916: (1) The complete failure of the picking operations to exert any appreciable beneficial effect on the weevil infestation, and (2) the injurious effect of the use of the bag-and-hoop upon the plants themselves. It is thought that in a year of light infestation a slight degree of benefit may be secured from the picking operations, but that in a year of average or heavy infestation this benefit is completely lost. The mechanical picker failed to give satisfactory results.

The bulletin concludes with a discussion of the relation between labor supply and malaria.

The introduction into Canada of the ichneumon fly, Mesoleius tenthredinis, a parasitic enemy of the larch sawfly, Nematus erichsonii, C. G. Hewitt (*Agr. Gaz. Canada, 4 (1917), No. 5, pp. 355–357, fig. 1*).—The author records the introduction of *M. tenthredinis* from England where it parasitizes a high percentage of the larch sawfly. Cocoons were distributed at several points in Quebec and Ontario in 1911, in the Riding Mountain Forest Reserve, east of Cedar Lake, Manitoba, in the spring of 1912, and near Aweme, southern Manitoba, in the spring of 1913, and the parasite appears to have become established.

A second importation of the European egg parasite of the elm leaf beetle, L. O. Howard (*Jour. Econ. Ent., 10 (1917), No. 5, pp. 504, 505*).—The author records the second importation of *Tetrastichus xanthomelænæ* into this country (E. S. R., 20, p. 957) and its distribution in Philadelphia, Washington, D. C., and Ithaca, N. Y., in June, 1917.

A new American parasite of the Hessian fly (Mayetiola destructor), P. R. Myers (*Proc. U. S. Nat. Mus., 53 (1917), pp. 255–257*).—*Polygnotus vernalis*, reared in great abundance from Hessian fly puparia collected at various localities in Maryland, Pennsylvania, and West Virginia, is here described as new.

Adult hymenopterous parasites attached to the body of their host, C. T. Brues (*Proc. Nat. Acad. Sci., 3 (1917), No. 2, pp. 136–140, fig. 1*).—Under the name *?Lepidoscelio viatrix* the author describes a new scelionid, the females of which were received from Walajanagur in South India attached by the jaws to the abdomen of the common Jola or Dekkan grasshopper (*Colemania sphenarioides*) at the sutures. This habit of attaching to the body of the locust appears to be for the purpose of finding the eggs of the host more readily.

The type species of the genera of the Cynipoidea, or the gall wasps and parasitic cynipoids, S. A. Rohwer and Margaret M. Fagan (*Proc. U. S. Nat. Mus., 53 (1917), pp. 357–380*).

The red spider on cotton and how to control it, E. A. McGregor (*U. S. Dept. Agr., Farmers' Bul. 831 (1917), pp. 15, figs. 12*).—This is a revision of Farmers' Bulletin 735, previously noted (E. S. R., 35, p. 468).

New species of economic mites, H. E. Ewing (*Jour. Econ. Ent., 10 (1917), No. 5, pp. 497–501, figs. 2*).—Seven species of mites are here described, six of which are new to science, namely, *Tetranychus uniunguis* from arbor-vitæ at Urbana, Ill.; *T. multidigituli* from the bark of honey locust at Wooster, Ohio; *Schizotetranychus latitarsus* from bamboo at Pasadena, Cal.: *Caligonus mali* from apple leaves at Hillsboro, Oreg.; *Hypoaspis armatus* from lemon leaves at Whittier, Cal.; and *Monieziella bipunctata* from the base of buds of filbert in Oregon.

FOODS—HUMAN NUTRITION.

Report on canned vegetables, W. D. Bigelow (*Jour. Assoc. Off. Agr. Chem., 1 (1917), No. 1, pp. 1–21*).—Tables are given showing the results of analysis of the juice pressed from raw and cooked tomatoes, of different degrees of maturity at various times throughout the season (to show the effect of rainfall), tomatoes from blighted vines, and of different varieties of canned tomatoes. The drained solids, sugar as invert, acid as citric, sugar in solids, and acids in solids are given.

There was a higher percentage of sugar in the juices and a higher percentage of acid in the seed cavities. The solids increased as the tomatoes matured. No definite conclusion was warranted as to the relation between composition of tomato and amount of rainfall. The blighted vines had a light yield with fruits that had about the same composition as green fruit at the same stage of maturity. Variation in duplicate cans of tomatoes was as great as 10 per cent of the amount of total solids present.

Methods for analysis of tomato pulp are given.

The adequacy and economy of some city dietaries, H. C. Sherman and Lucy H. Gillett (*N. Y. Assoc. Imp. Condition Poor Pub. 121 (1917), pp. 32*).—One hundred and two studies were made, 87 in New York City and the rest in different parts of the country. Ten nationalities were represented and the study extended over 12 months in 1914–1915.

One-fourth of the families spent less than 25 cts. and one-fourth more than 40 cts. per day per person for food, with the greatest frequency from 25 to 35 cts. Thirty-six per cent of the diets were below 2,500 calories, 59 per cent were below 3,000 calories, and 76 per cent below 3,500 calories per man per day. The cheapest dietaries averaged 78 gm. of protein, with only 13 per cent below 75 gm. Of those getting 3,000 calories, 30.5 per cent were below the standard for

phosphorus (1.44 gm. per man per day), 40.2 per cent were low in calcium (0.69 gm. per man per day standard), 19.6 per cent were low in iron (15 mg. standard), and only 2 per cent had less than 75 gm. of protein.

If energy was sufficient the other food factors seemed to be adequately supplied also. Deficiencies frequently occurred where there was enough money to supply the needed food values but the food was poorly chosen. Relatively high expenditure for meat seemed to be more at the expense of vegetables and fruits than of any other type of food. The amount of calcium and the energy value seemed to decrease with the increase in expenditure for meat. As the percentage expended for grain products increased the total cost of the dietary decreased. At least ½ qt. of milk per man per day was needed to insure the proper calcium requirement.

Fats and sugars averaged about 20 per cent of the total dietary. There was a decided decrease in the percentage of calories from fats and sugar as the amount of iron increased.

A scheme is appended for calculating the value of foods according to their calorie, calcium, phosphorus, iron, and protein content, and tables showing the score value of some common typical foods.

The food of working women in Boston, Lucile Eaves (*[Boston]: Women's Ed. and Indus. Union, 1917, pp. 213*).—The study was conducted from December to March, 1915, and covered economic and social phases, as well as the nutritive value, of the food. A large number of studies were made dealing with noon lunches, food problems of women not living with families, the food of women in cooperative houses, the Y. W. C. A., etc., and the food of certain dispensary patients.

The menus, on the whole, showed a healthful variety but no evidence was discovered of an intelligent effort to get a balanced ration at minimum cost. Bread constituted 33 per cent of the total range of food eaten by women earning less than $6 per week. There was a small use of other cereals. Tea and coffee and protein foods were taken on an average of 16 times a week. The diet of higher wage women contained more mineral and less protein and was less constipating.

In the cooperative houses, the Y. W. C. A., etc., the lowest protein consumption was 58.6 gm., and the highest 100.1 gm. per day. The lowest calorie consumption was 1,760 per day, and the highest was 3,350. There was a great variation in the dietary from day to day.

A new form of food chart: The inometer, T. Johnson (*Dept. Agr. anl Tech. Instr. Ireland Jour., 17 (1917), No. 3, pp. 443–450*).—The chart here described represents an attempt to arrange common food materials according to their fuel value and at the same time to show the cost and the ratio of protein to energy of each, and also to indicate the commonly accepted energy requirements for men of varying muscular activity. The practical utility of the chart is impaired by the fact that while the energy values are based on edible portion data, the prices quoted are for material as purchased. All figures used for computing fuel values are based on analyses published by the U. S. Department of Agriculture.

ANIMAL PRODUCTION.

The selection problem, R. Pearl (*Amer. Nat., 51 (1917), No. 602, pp. 65–91*).—This is a brief review of some of the more important findings regarding the selection problem that have accumulated in the experimental study of evolution, and a plea for more investigations as to the causes of genetic (factorial) variation.

The theory of the gene, T. H. MORGAN (*Amer. Nat., 51 (1917), No. 609, pp. 513–544, figs. 12*).—In this paper the attempt is made to explain what the genetic factor means to those who use it, and to answer some of the objections to the factorial hypothesis of heredity.

Statistical studies of the number of nipples in the mammals, J. A. HARRIS (*Amer. Nat., 50 (1916), No. 599, pp. 696–704*).—A review of statistical studies upon the type, variation, and correlation in number of mammæ; correlation between the number of the young in the litter and the number of mammæ in the dam; and inheritance of number and arrangement of nipples in swine.

Observations on the skulls of hybrids between wild and domestic horses and cattle, I. PHILIPTSCHENKO (*Compt. Rend. Soc. Biol. [Paris], 78 (1915), No. 18, pp. 636–638; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 2, pp. 246–248*).—Measurements were made of skulls of (1) hybrids between ordinary cattle and species of Bison, namely, American bison (*B. americanus*) and "zubr" (*B. bonasus*); and (2) hybrids between horses and zebras. The inheritance of skull characters in the case of these hybrids showed the usual complexity found in hybrids between species.

Studies on inbreeding.—VII, Some further considerations regarding the measurement and numerical expression of degrees of kinship, R. PEARL (*Amer. Nat., 51 (1917), No. 609, pp. 545–559, fig. 1*).—The author repeats and extends his definitions of the basic concepts of inbreeding (E. S. R., 32, p. 665), and on the basis of these definitions a new and more accurate method of measuring and expressing numerically the degree of kinship between any two individuals whatsoever, whose pedigrees are known, is set forth and illustrated by examples. A new constant, the partial inbreeding index, is described. Its purpose is to indicate numerically the part of the total inbreeding exhibited in the pedigree of any individual which is due to relationship between the sire and the dam of that individual.

Fecundity and the relation between male and female descendants in improved German pigs, A. MACHENS (*Berlin. Tierärztl. Wchnschr., 31 (1915), No. 47, pp. 559–562; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 2, pp. 256, 257*).—The author studied 3,464 offspring of the improved German pig recorded in the Herd-Book of the Breeders' Syndicate of the Duchy of Brunswick.

The average number of pigs per litter was found to be 9.56, the maximum generally being reached in the fourth litter. The first litter of a young sow usually contained more males than females. After the fifth litter the females predominated. In small litters there was a majority of males, and in large litters a majority of females. The fecundity was higher from September to March than in the warm period during the rest of the year.

Maturation of the ovum in swine, G. W. CORNER (*Anat. Rec., 13 (1917), No. 2, pp. 109–112*).—The author gives a brief review of the literature of the subject, together with descriptive notes of a series consisting of 15 ova from 7 sows.

The results of a study of these ova indicate that the sequence of maturation is the same in swine as in previously studied forms of other orders. The first polar body is extruded and the second polar division proceeds as far as spindle formation before fertilization, the second polar body being cut off only after the entrance of the spermatozoon.

Experimental intersexuality and the sex problem, R. GOLDSCHMIDT (*Amer. Nat., 50 (1916), No. 600, pp. 705–718, figs. 3*).—A review of the quantitative conception of sex determination.

Results of breeding experiments with gipsy moths are cited which are interpreted to show (1) that two nearly related forms, both normal in regard to sex-inheritance, produce if crossed in one direction normal offspring, in the other direction normal males and intersexual females; (2) that the degree of intersexuality is definite in a given cross, but different in different crosses; (3) that intersexuality shows Mendelian segregation; and (4) that males may become intersexual in certain crosses. Both sexes contain the anlage for either sex. In both sexes, irrespective of the zygotic constitution, both anlages might become patent. Which one is to appear depends entirely upon the quantitative relation of both.

The control of sex, A. Morosini (*Nuovi Ann. Agr. Siciliana, 6. ser., 4 (1915), No. 3, pp. 162–169; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 3, pp. 398, 399*).—The author summarizes the more important hypotheses advanced on the subject of the determination of sex, and reports results of laboratory experiments on the nature of the sex cells. He concludes that sexual dimorphism can not result from the action of the same factors in all species, and that the real crux of the question must be sought in various circumstances which, according to the particular case, act on the metabolism, and consequently also on the sexual differentiation.

Combining the more important factors which other biologists have applied separately in each case, the author announces that he has succeeded in obtaining for a long series of generations of different pairs of animals, litters exclusively unisexual, first all males and then entirely females from the same parents.

A method of calculating food values, H. Süchting (*Jour. Landw., 64 (1916), No. 3, pp. 173–180*).—A method is proposed of estimating the value of a food based on 1,000 calories as a unit, and with a comparative value of 1 kg. starch equal to 4,000 calories. It is claimed that this unit, while not exact, is simpler and more practical than the starch unit proposed by Kellner. It is deemed more practical to determine the value in terms of fuel rather than in terms of one of the components of the food as starch. As the starch content varies in foods it widens the limit of error. The digestible food values he would express in heat units.

In estimating the value of a food, instead of reducing the digestible nutrients to starch values he would place 1 kg. each of protein, fat, and nitrogen-free extract as equal to 4, 9, and 4 Kellner values, respectively.

The composition of some fodder grasses of German East Africa, F. Honcamp and H. Zimmermann (*Landw. Vers. Stat., 87 (1915), No. 4–5, pp. 351–363*).—Food analyses of the following plants are given, together with a discussion of their range and botanical characteristics: *Eragrostis superba*, *E. minor*, *Pappophorum scabrum*, *Sporobolus robustus*, *S. spicatus*, *S. rehmanii*, *Aristida adscensionis*, *Cynodon plecto stachyum*, *Chloris virgata*, *C. myriostachya*, *C. gayana*, *Dactyloctenium ægyptiacum*, *Leptocarydium alopecuroides*, *Digitaria horizontalis*, and *Pennisetum ciliare*.

Comparative value of concentrated protein meals for dairy cattle, sheep, and swine, E. S. Archibald (*Agr. Gaz. Canada, 3 (1916), No. 8, pp. 687–692*).—This experiment was undertaken to compare the palatability and nutritive value of linseed-oil cake, cottonseed meal, gluten feed, fish meal, and peanut-oil meal.

All the feeds were found to be palatable. Their relative values at local prices were based upon gluten meal at $32 per ton. The following table gives the comparative standing of the various feeds, with the several classes of animals under experiment:

Comparative standing of various feeds for different animals.

Kind of feed.	Milch cows.		Finishing lambs.		Feeding pigs.	
	Production of milk and fat.	Economy of production at prices quoted.	Total gains.	Economy of gains at prices quoted.	Total gains.	Economy of gains at prices quoted.
Gluten feed, 23 per cent protein	First	First	Third	First	Fourth	Third.
Linseed-oil meal, 35 per cent protein.	Second	Second	Fourth	Fourth	Second	Second.
Cottonseed meal, 43 per cent protein.	Fourth	Third	Fourth	Fifth	First	First.
Peanut-oil meal, 41 per cent protein.	Third	Fourth	First	Third	Fifth	Fourth.
Fish meal, 63 per cent protein	Fifth	Fifth			Sixth	Sixth.
Corn			Second	First	Third	Fifth.

The by-products of rice milling, J. B. REED and F. W. LIEPSNER (*U. S. Dept. Agr. Bul. 570* (*1917*), *pp. 16, pl. 1*).—A description of the milling process, analyses of rice and its by-products, and a discussion of results are given. The milling process is illustrated by a diagram showing the progress of the grains through the various stages.

Three by-products result from the milling process—rice hulls, rice bran, and rice polish. The percentage of hulls varies from 18.7 to 20.9, of brans and polish from 10 to 11.7. The moisture of the rough rice is mainly in the kernel. The rice hulls are very high in both ash and fiber and so low in protein and fat as to have practically no feeding value. The brans usually found on the market are a mixture of the stone-reel bran and the huller brans, since the latter do not keep well alone. This mixture should contain over 26 per cent fat plus protein and should not exceed 13 per cent of crude fiber or 5 per cent of ash insoluble in hydrochloric acid.

Inspection of feeding stuffs (*New York State Sta. Bul. 434* (*1917*), *pp. 141–309*).—Analyses are reported of various feeding stuffs collected during the fall and winter of 1916–17. Among the samples examined were cottonseed meal, linseed meal, malt sprouts, distillers' and brewers' dried grains, yeast and vinegar dried grains, corn-gluten feed and meal, hominy feed, meat scrap, meat meal, tankage, fish scrap, bone meal, blood meal, corn meal, alfalfa meal, wheat bran, wheat middlings, buckwheat products, corn-germ meal, rye by-products, barley by-products, ground screenings, red-dog flour, oats, dried beet pulp, dried bread, pea meal, peanut-oil meal, oat hulls, corn bran, and various mixed and proprietary feeds.

[Animal husbandry] work of the Belle Fourche reclamation project experiment farm in 1916, B. AUNE (*U. S. Dept. Agr., Bur. Plant Indus., Work Belle Fourche Expt. Farm, 1916, pp. 6–8, 11, 12, 16–19, fig. 1*).—An inventory of the live-stock industry on the project is given which shows a steady increase each year from 1913.

In an experiment in pasturing alfalfa with sheep 10 lambs averaging 75 lbs. in weight were used on 1 acre of third-crop alfalfa. The acre was divided into two parts, on which the sheep were turned in on August 28, 1915, and pastured alternately for 40 days. The lambs made a total gain of 155 lbs. on the acre, an average of 0.39 lb. each per day. On May 29, 1916, 10 yearling sheep were turned in on the same acre of alfalfa and pastured for 120 days. They gained during that period 266.5 lbs. At no time during the experiment was there any trouble with bloat in the animals nor was there injury to the alfalfa. The two experiments indicate that an acre of alfalfa divided into two parts and irrigated frequently will support in good condition from 1,400 to 1,700 lbs. live weight of sheep.

In a 6-year rotation a 3-year-old stand of alfalfa was pastured with hogs and the corn hogged off. While on pasture the hogs were fed a daily ration of 2 lbs. corn for each 100 lbs. live weight. The net return per acre of alfalfa from 1913 to 1916, inclusive, ranged from $21.14 to $62.97. The alternate pasture method is advised. Pastured alfalfa should be irrigated more frequently than when grown for hay, and animals should be kept off while the soil is wet and until the plant makes new growth. Alfalfa should not be too closely pastured, as the fields will be very slow to recover.

In hogging corn 12 animals of about 100 lbs. each were employed per acre. The gains and profits for the years from 1912 to 1916, inclusive, ranged from $23.80 to $40.72.

An experiment was made during the year in harvesting alfalfa and corn with sheep. The results from the season indicate that corn can be harvested by lambs as profitably as by hogs.

Energy values of hominy feed and maize meal for cattle, H. P. ARMSBY and J. A. FRIES (*U. S. Dept. Agr., Jour. Agr. Research, 10 (1917), No. 12, pp. 599–613*).—In cooperative investigations between the Pennsylvania Institute of Animal Nutrition and the Bureau of Animal Industry a specific comparison was made of maize meal with hominy feed by methods previously reported (E. S. R., 36, p. 469). The experiment was carried out with two steers of similar type and breed. The composition of feeds, weights of animals, digestibility of feeds, energy values, heat production, etc., are shown in the tables.

An increase in the mixed ration of hay and hominy feed consumed resulted in a slightly decreased digestibility, while a greater increase in the amount of mixed hay and maize meal consumed caused a considerable decrease in digestibility. The losses of energy in the excreta were greater with the maize meal than with hominy feed, due chiefly to the lower digestibility of the former, especially in the heavier ration. The metabolizable energy of digestible organic matter was greater for the hominy feed than for the maize meal, the difference being due to the higher gross energy and smaller losses in the former case. The increment of heat production of dry matter consumed was slightly less for the hominy feed than for the maize meal, but slightly greater than the average of all experiments in maize meal.

"The net energy value of the hominy feed in this experiment was distinctly greater than that of the maize meal. A computation of the net energy values based on the average composition and digestibility of the two materials reduced this difference to an insignificant amount."

Corrections are reported for the net energy values of hominy feed and maize meal contained in earlier tables, the corrected values 85.5 therms for dent maize, 84 for flint maize, 85.2 for maize meal, and 88.78 for hominy feed.

Steer feeding experiments, W. H. TOMHAVE and B. O. SEVERSON (*Pennsylvania Sta. Rpt. 1915, pp. 156–188, pls. 7*).—Most of the results reported have been previously noted (E. S. R., 37, p. 365).

In a comparison of molasses with corn, the results with two lots of 6 steers each indicate that 5 lbs. per head per day of molasses could be used for a short period of 60 days with good results. A limited amount of molasses (1 lb. daily per head) increased the utilization of inexpensive roughage.

Molasses in a concentrated grain ration for heavy feeders was not advisable when fed over long periods, as 140 days. The average daily gains per head were 2.36 lbs. for each lot, and the respective costs per pound of gain 11.66 and 12.62 cts. The gains were made with a lesser amount of dry matter on the ration made up of corn, cottonseed meal, mixed hay, and corn silage. The feeding of a concentrated grain ration to the capacity of the steers for 140 days

during 1914–15 proved unprofitable, as did the finishing of prime cattle of 1,300 to 1,400 lbs., due to the unsatisfactory market conditions. Molasses, at $20 per ton, was even less profitable than corn, at 70 cts. per bushel.

Body measurements of steers, W. H. TOMHAVE and B. O. SEVERSON (*Pennsylvania Sta. Rpt. 1915, pp. 188–208*).—The measurements were taken of 72 steers used in the feeding experiments noted on page 68, to gather data from which correlations might be shown between form, represented by body measurements, and gains in weight. The measurements and weights were obtained at the beginning and the end of the feeding experiments, and the individual data for each animal are shown in tables.

The maintenance of a beef-breeding herd, W. H. TOMHAVE and B. O. SEVERSON (*Pennsylvania Sta. Rpt. 1915, pp. 107–156, pls. 9*).—A more detailed account of the work previously noted (E. S. R., 35, p. 168).

The economic importance of Aberdeen-Angus cattle, W. A. STEWART (*Jour. Bd. Agr. [London], 23 (1916), No. 8, pp. 756–760*).—Brief notes are given on the value of Aberdeen-Angus cattle for beef and milk production and for crossing with other breeds.

[Zebu cattle], R. L. LUÁCES (*El Ganado Cebú en el Mejoramiento de Nuestra Ganaderia. Habana, Cuba: Sec. Agr. Com. y Trab., 1916, pp. 33, pls. 21*).—A discussion of breeds and cross breeds of cattle and their adaptation to the tropics. Attention is called to the value of Zebu cattle, especially in tick infested countries. The results of crossing Zebu with native and other breeds of cattle are illustrated and described.

Calf-rearing experiments at Woburn, 1916–17, J. A. VOELCKER (*Roy. Agr. Soc. England, Occas. Notes, No. 2 (1917), pp. 9, 10*).—The results of a 14 weeks' trial with crushed oats, calf meal, beans, palm-nut cake, and maize and fish meal are reported. The highest gains were given with the maize and fish meal mixture, closely followed by the palm-nut cake and oats mixture. Difficulty was experienced in getting the calves to eat the palm-nut cake alone in the beginning, though they did well on it.

Farm sheep raising for beginners, F. R. MARSHALL and R. B. MILLIN (*U. S. Dept. Agr., Farmers' Bul. 840 (1917), pp. 24, figs. 6*).—Information on the general outlook for sheep raising in the United States and regions of the country especially adapted to farm sheep raising is given, together with suggestions to beginners on the management of the farm flock and the preparation of lambs for market.

Dry lot v. pasture crops for growing and fattening pigs for market, W. H. TOMHAVE and H. H. HAVNER (*Pennsylvania Sta. Rpt. 1915, pp. 220–226*).—A continuation of the work previously reported (E. S. R., 35, p. 568).

In this experiment 40 pigs were used. Lot 1 (on a dry lot of ½ acre well drained and shaded) consisted of 21 pigs fed on a ration of corn meal and tankage 8:11. Lot 2, on a pasture lot of three 1-acre plats, A (oats and peas), B (corn), and C (rape), was composed of 19 pigs fed a ration of corn meal and tankage 12:1. The pigs were transferred from plats A, B, and C as these became exhausted.

The average daily gain of lot 1 for 91 days was 1.029 lbs. per head, as compared with 0.873 lb. gain made by lot 2. Lot 1, however, required 4.07 lbs. grain per pound of gain to 3.31 lbs. for lot 2. Lot 2 made gains at a cost lower by from 1.04 to 1.44 cts. per pound than lot 1.

Fattening pigs for market, W. H. TOMHAVE and H. H. HAVNER (*Pennsylvania Sta. Rpt. 1915, pp. 226–231, pls. 6*).—A continuation of the work previously reported (E. S. R., 35, p. 568).

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In the present experiment 16 pigs averaging 142.9 lbs. were fed for 70 days with the following results:

Results of experiments in fattening pigs for market.

Lot	Feed.	Average feed per head consumed daily.	Average daily gain per head.
		Lbs.	*Lbs.*
I	Corn meal and tankage 10:1	7.60	1.978
II	Shelled corn and tankage 10:1	6.77	1.564
III	Corn meal and buttermilk 1:1	7.71	2.033
IV	Corn meal and wheat middlings 1:1	5.09	.909

The rations containing corn and corn meal with tankage and buttermilk proved profitable. There was little difference in the cost of the first three rations, and a choice should depend upon the price of these feeds in the locality and upon the conditions existing on the individual farm. There was no gain in grinding corn for pigs when the price was below 50 cts. per bushel. Either buttermilk or tankage was a cheaper source of protein for the pigs than wheat middlings.

Report on pig feeding experiments conducted at the college farm, Kilmarnock, in 1914 and 1915, W. G. R. Paterson and L. Robb (*West of Scot. Agr. Col. Bul. 75 (1916), pp. 12*).—The experiment was made to compare the feeding of a grain ration (1) raw and dry, (2) soaked in whey and fed moist, and (3) scalded with water and fed moist. The experiments were carried on through two periods of 16 weeks, each using 48 pigs divided into three lots.

The pigs fed the grain dry made the greatest progress and most economical gains. They also showed the best general appearance. The average weekly gains for the pigs fed the dry ration were 7 lbs., soaked in whey 6.66 lbs., and scalded 6.6 lbs., with a cost per pound of 3.3d., 4.3d., and 3.5d., respectively. In a second experiment one lot was fed dry grain with one-eighth part of the grain substituted by fish meal. The pigs on the dry ration gained 8.8 lbs. weekly, dry ration with one-eighth fish meal 9.5 lbs., and scalded 8.3 lbs. The cost per pound of gain was 3.5d., 3.3d., and 3.7d., respectively.

Report on experiment on the feeding of pigs carried out at Calderwood Estate, East Kilbride, J. Wyllie (*West of Scot. Agr. Col. Bul. 77 (1916), pp. 79–98*).—The experiment was made to test the efficacy of palm-nut cake or meal in the ration for fattening pigs.

Thirty-two pigs, one-half males and one-half females, were divided into four lots. Lots 1 and 3 were fed a mixture of meals dry. Lots 2 and 4 were fed the same mixture but with 4 parts of palm-nut cake added to 10 parts of the mixture. At the end of 95 days, 8 pigs were slaughtered, and at intervals of from one to two weeks 8 more were killed. Lots 1 and 3 made an average daily gain per head of 1.19 lbs., requiring 4.48 lbs. of grain per pound of gain. Lots 2 and 4 gained a daily average of 1.26 lbs. per head, using 4.62 lbs. of the feed per pound of gain. The average cost of the ration per pound of gain was with lots 1 and 3, 4.41d., and with lots 3 and 4, 4.79d.

Comparing lots 1 and 2 (barrows) with lots 3 and 4 (sows), the gains cost 5.09d and 4.11d, respectively. However, in the dressed weights the percentages were enough higher with the barrows to nearly equalize the costs.

No difficulty was found in getting the pigs to eat the palm-nut cake.

Fattening draft horses for market, H. H. Havner and C. L. Goodling (*Pennsylvania Sta. Rpt. 1915, pp. 208–219, pls. 17*).—Continuing previous work (E. S. R., 28, p. 171), experiments with 30 head of draft horses, divided into five lots of 6 horses each and fattened for market, gave the following results:

Results of experiments in fattening draft horses for market.

Lot.	Feed.	Average daily gain per head.	Cost per pound of gain.
		Lbs.	*Cts.*
I	Shelled corn, cottonseed meal, corn silage, and timothy hay	1.03	21.7
II	Shelled corn, molasses, cottonseed meal, and timothy hay	1.07	26.9
III	Shelled corn, cottonseed meal, and timothy hay	1.39	20.8
IV	Equal parts shelled corn and oats; timothy hay	2.32	15.9
V	Shelled corn and alfalfa hay	2.17	14.4

At the prices prevailing the ration of shelled corn and alfalfa hay produced 1 lb. of gain at the lowest figure, giving a greater profit than any other ration used, while the standard ration of corn, oats, and timothy hay ranked second. Replacing the corn with an equal amount of molasses (2.8 lbs. daily) was not found practical. Molasses is an appetizer and in this amount is not a substitute for corn. Silage in the ration caused a lessened consumption of hay and grains, but did not produce so large gains.

The encouragement and improvement of light horse breeding, 1915–16 (*Jour. Bd. Agr. [London], 23 (1917), No. 12, pp. 1194–1202*).—This is a brief review of the horse breeding operations of the British Board of Agriculture and Fisheries during the year ended October 31, 1916.

Poultry-feeding tests, F. C. Brown (*Jour. Agr. [New Zeal.], 14 (1917), No. 6, pp. 464–468, fig. 1*).—Owing to the high price of wheat this experiment was carried out to find substitutes in poultry feeding.

Two pens of White and two of Brown Leghorns, each pen of 6 birds, were fed during two periods of one year each. All lots the first year were fed pollard, bran, maize meal, and meat and bone meal, two lots wheat, and two lots alfalfa chaff and oats. In the second year alfalfa meal was substituted for pollard in two lots.

The White Leghorns with wheat in the ration averaged 239 eggs per year and without wheat, 238 eggs, and gave profits per bird of £1 2s. 6d. and £1 1s. 9d., respectively. The Brown Leghorns with wheat in the ration averaged 243 eggs per year and without wheat, 241 eggs, and gave profits per bird of £1 2s. 9d. and £1 2s. 6d., respectively. In the second year the White Leghorns with wheat laid 159 eggs and without wheat, 173 eggs. The Brown Leghorns 179 eggs with wheat and 201 eggs without wheat. The profits per bird were for White Leghorns fed wheat 13s. 5d. and without wheat 14s. 11d., and for Brown Leghorns 16s. 4d. and 18s. 4d.

From these experiments it appears that wheat and even pollard are not indispensable in the profitable production of eggs. Meat meal may be fed in large amounts, if kept separately so that the hens can eat it as wanted. The quantity eaten is influenced by the number of eggs laid. Alfalfa meal is deemed preferable to the chaffed alfalfa hay and does not require steaming overnight.

A study of the proteins of certain insects with reference to their value as food for poultry, J. S. McHargue (*U. S. Dept. Agr., Jour. Agr. Research, 10 (1917), No. 12, pp. 633–637*).—In this contribution from the Kentucky Experi-

ment Station, attention is called to the necessity, owing to the increased cost, of utilizing every source of animal protein. The efficiency of animal protein over that of vegetable origin is noted and certain experiments are cited to bear out the statement. It is further pointed out that both wild and domesticated birds seek insects, two of which—grasshoppers and June bugs—studied by the author, show a high lysin content. June bugs, while containing a slightly greater protein content, are not so plentiful as grasshoppers and are not therefore so economical as a source of protein. The grasshoppers contain a higher protein content than meat meal, and could be dried and used in rations for live stock.

The following analyses of grasshoppers and June bugs, compared with lean beef and white turkey meat, are reported:

Amino-acid groups in animal proteins from different sources.

Group.	Grass-hoppers.	June bugs.	Beef roast.	Turkey white meat.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*
Ammonia nitrogen	9.14	8.96	3.27	5.65
Melanin nitrogen	3.42	6.78	5.22	1.72
Arginin nitrogen	14.98	11.53	15.44	14.72
Histidin nitrogen	5.62	6.57	13.34	18.23
Cystin nitrogen	.23	.35	.49	.47
Lysin nitrogen	8.04	8.02	8.40	7.67
Amino nitrogen (in filtrate from bases)	52.87	50.80	40.89	42.41
Nonamino nitrogen (in filtrate from bases)	4.32	5.84	9.38	7.26
Total	98.62	98.85	96.43	98.13

[Report of poultry laying competitions, 1912–1915], F. W. Rhodes et al. (*Harper Adams Agr. Col. Buls. 1 (1914), pp. 50, pls. 5, figs. 7; 1 (1915), pp. 83, figs. 4; 1 (1916), pp. 54, pls. 7, fig. 1*).—Detailed reports are given of the first three annual egg-laying competitions conducted by the Harper Adams Agricultural College, Salop County, England, in conjunction with the Utility Poultry Club. The first two of these contests lasted 12 months each, and the third 10 months. Tabulated data show the egg production, etc., of each bird in the contest. The average egg yield per bird during the first contest was 151.9, during the second 187.2, and during the third (10 months) 168.5.

Egg-laying tests at Hawkesbury Agricultural College, 1916–17, G. D. Ross and J. Hadlington (*Agr. Gaz. N. S. Wales, 28 (1917), No. 5, pp. 337–355, figs. 11*).—This is a detailed report of the fifteenth annual egg-laying contest held at the Hawkesbury Agricultural College. This competition was the first one of this series that has been conducted entirely upon the basis of single-hen pens for first-year hens. A Black Orpington hen laid 312 eggs and a White Leghorn hen laid 308 eggs during the 365 days of the contest. These are said to be world's records.

Marketing eggs by parcel post, L. B. Flohr (*U. S. Dept. Agr., Farmers' Bul. 830 (1917), pp. 23, figs. 7*).—A summary of the conditions and possibilities of the parcel post in furthering direct sales between the producer and the consumer of eggs.

The work is based on the results attained in trial shipments of about 761 doz. eggs in lots of 1 to 10 doz. each. Of the whole, 327 eggs were broken, of which 209, or 2.3 per cent, were beyond use.

Essentials to successful marketing are pointed out, containers described, and postal regulations given.

DAIRY FARMING—DAIRYING.

Some nitrogen studies with dairy cows in milk, F. S. PUTNEY and C. W. LARSON (*Pennsylvania Sta. Rpt. 1915, pp. 250–293, pls. 4*).—The studies here reported were undertaken for the purpose of giving a thorough experimental trial of the method of computing dairy rations according to the Armsby net energy standard (E. S. R., 27, p. 176).

The digestion trials, which were conducted during the winters of 1914 and 1915, were made with three groups of 3 cows each. During the tests each group was fed (1) timothy hay, silage, and grain mixture No. 286 (corn meal, distillers' grains, cottonseed meal, gluten feed, and wheat bran 4:1.25:1:1:1); (2) alfalfa hay, silage, and grain mixture No. 286; and (3) alfalfa hay, silage, and grain mixture No. 287 (the above concentrates mixed in the proportion of 2:1.25:1.5:1:1).

The energy requirements for maintenance and the energy supplied in the feed were calculated according to the method already noted (E. S. R., 19, p. 65). The energy requirements in the milk were calculated at the beginning of each test from the average milk production according to formulas which are set forth. Enough roughage, in the proportion of 5 lbs. of silage to 1 lb. of hay, was fed to maintain properly the energy requirements of the animal and to produce 5 lbs. of milk. In addition to the roughage, enough of each grain mixture was fed to balance the energy requirements as found by using the above-mentioned formulas. No attention was paid to the amount of protein fed.

The 9 cows used in the experiments represented several breeds and showed a wide range in age, average milk yield, fat content of milk, and stage of lactation. Each winter the visible excreta was collected from one cow from each group for three periods of from 5 to 10 days each. The nitrogen in composite samples of feces, urine, and milk, and the fat and specific gravity of milk were determined. Analyses were also made of the feeds used. Tabulated data show for each cow and period the amount of feed offered and refused, the average live weight, the yield and analyses of milk, the water consumed and urine and dung excreted, the calculated nitrogen balance, the percentage distribution of nitrogen in outgo, the difference between total digestible protein fed and protein requirements according to Eckles (E. S. R., 30, p. 773), and the percentage of nitrogen utilized.

It is noted that little difference existed in the daily amount of water drunk on the different rations. However, the average daily urine excreted was noticeably less when timothy hay was fed. The average daily milk yield was also slightly less when timothy hay was fed. The average live weight of the cows was maintained. There was practically no difference in the average daily excretion of dung on the different rations.

The calculated nitrogen distribution in the 1914 tests showed that there was a noticeable increase in the percentage of nitrogen in the urine on the rations when more nitrogen was fed. The largest percentage of nitrogen was secured in the milk when the ration contained a small amount of nitrogen. During the feeding of alfalfa and grain mixture No. 287, 7 cows showed a gain of nitrogen. When the cows under three months of lactation period are compared with those over five months the results possibly indicate that the former group were still drawing nitrogen from their bodies to furnish milk. These results were for the most part confirmed in the 1915 tests. Most of the cows used in 1915 were early in their period of lactation, but the average of those under three months on lactation period showed an increase of nitrogen in percentage of milk. The average percentage utilization of nitrogen for all the cows and periods in 1914 was 62 and in 1915, 50. The authors believe that this difference may be due to

the difference in the lactation and gestation periods of the cows used in the experiments.

No definite conclusions as to the protein requirements of dairy cows in milk are suggested, but the results are thought to indicate that the standard proposed by Eckles is a safe guide for practical feeding.

Standard cows, W. A. N. Robertson (*Jour. Dept. Agr. Victoria, 15 (1917), No. 9, pp. 513–541, figs. 15*).—This is the fifth annual report on the testing of pedigree herds of dairy cows, conducted by the Victoria Department of Agriculture for the year ended June 30, 1917. During the year 265 cows completed their 273 days' term. Of the three breeds represented, 176 Jerseys, 20 Ayrshires, and 38 Red Polls obtained certificates, thereby becoming "standard cows." The records of the certified cows for the year are tabulated.

Should all heifers be raised? W. J. Fraser (*Cream. and Milk Plant Mo., 6 (1917), No. 2, pp. 65–67*).—It is noted that of a large number of cows tested in dairy herds in different parts of the State the poorest third produced an annual average of 3,654 lbs. of milk and 134 lbs. of milk fat, each cow lacking about $7 of paying for her keep. The middle third of these cows averaged 5,000 lbs. of milk and 198 lbs. of fat and returned a yearly profit of about $7 each. The best third averaged 6,765 lbs. of milk and 278 lbs. of fat, each cow making an annual profit of about $27. The author advocates saving only the heifer calves from the best third of the cows, and these calves should be sired by bulls from good producers.

Age at first calving, G. C. White (*Jour. Dairy Sci., 1 (1917), No. 2, pp. 139–147, figs. 2*).—Tabulated data are given showing the age at first calving and the milk and fat production during each lactation period of the 12 Holstein cows in the Connecticut College dairy herd. Of the 10 of these cows which have completed a year or lactation period, 5 are grouped as early calvers, or those calving at 30 months of age or under, and 5 as late calvers, or those calving at the age of over 30 months. The production for each lactation period of each group is averaged and discussed.

No conclusions are drawn.

Sunflowers as a silage crop, G. Lagrange (*Jersey Bul. and Dairy World, 36 (1917), No. 45, p. 1749, figs. 2*).—Sunflowers cut at the blooming stage were successfully used as silage. Cows greatly relished the sunflower silage but did not eat as much of it in bulk as they did of corn silage.

Bacteriological methods for determining the quality of milk. I.—The reaction of agar for the bacterial analysis of milk, J. M. Sherman and F. P. Reynolds, jr. (*Pennsylvania Sta. Rpt. 1915, pp. 294–299, pls. 5*).—Comparisons were made of agars with neutral, +0.5, +1, and +1.5 reactions, phenolphthalein being used as indicator. The lactose agar plates were incubated for 48 hours at 37.5° C. Average counts of 10 plates each of 15 samples of milk show much lower counts obtained with the +1.5 reaction than with the others. In all these samples the +0.5 agar gave the highest counts. In a further comparison of +0.5 and +1 agars 12 samples were plated as above. In 9 of these samples the higher count was obtained with the +0.5 agar.

In order to get definite information on the size of colonies which develop on agars of different reactions, pure cultures of four common milk organisms were plated, and the colonies were measured with a micrometer. The organisms used were *Bacterium lactis acidi*, *Bacillus coli*, a liquefying coccus from the interior of the udder (probably *Micrococcus albus*), and an udder streptococcus. The ten largest colonies on each plate were measured except in the case of *B. lactis acidi* in which case ten average sized colonies were measured. The colonies of *B. lactis acidi* were measured differently because this organism produced a few

surface colonies which were very much larger than those which grew under the surface and so only deep colonies were measured. In every case the size of the colonies decreased with an increase in acidity beyond +0.5, while in all except *B. lactis acidi* the neutral reaction gave slightly larger colonies than did the +0.5 agar. The streptococcus and micrococcus failed to develop on agar with a reaction of +1.5. With *B. lactis acidi* there was a much greater difference in the size of the surface colonies on the different reactions than there was in the case of deep colonies. By using the surface colonies of *B. lactis acidi* the following diameters were obtained: Neutral—1,280 microns, +0.5—1,320 microns, +1—630 microns, and +1.5—200 microns. The relative sizes of the colonies on agars of different reactions are represented graphically. It is recommended that +0.5 be adopted as the standard reaction of agar for the bacterial analysis of milk.

The determination of bacteria in ice cream, S. H. AYERS and W. T. JOHNSON, JR. (*U. S. Dept. Agr. Bul. 563 (1917), pp. 16, fig. 1*).—After calling attention to the difficulty of making accurate bacteriological analyses, the authors report results of experiments, the object of which was to throw light upon the evenness of distribution of bacteria in ice cream.

The results indicate that "bacteria in commercial ice cream are distributed quite evenly, and that an analysis of one sample from a gallon of ice cream gives results which will hold for any other similar sample from the same gallon. Storage of ice cream for 11 days in a commercial ice cream cabinet or in a hardening room for a period of two months did not seem to cause an uneven distribution of bacteria. In a series of from five to ten samples taken directly from a large commercial freezer, the bacterial counts on each sample checked within the usual limits of error of bacterial analyses."

In a comparison of two methods of incubation it was found that incubation at 37° C. for 48 hours did not give counts which showed greater variation than those obtained by incubation at 30° for five days. It is noted, however, that the counts obtained by the latter method of incubation were practically double those obtained by the former.

A study was also made of the question as to which dilution will give the more accurate count. The results show that when dilutions were such that about 200 colonies were present on the plates a lower variation between counts of samples of ice cream was found than when there were 50 or fewer colonies per plate.

Variations between duplicate counts from the same sample and the same dilution ranged from 7 to 26.6 per cent. Among duplicate plates in the examination of other samples of ice cream a variation as high as 41 per cent was found. "This must be remembered in connection with the fact that the variation found in our experiments between average counts of different samples of ice cream from the same gallon lot ranged, generally speaking, between 20 and 30 per cent. To this variation between duplicate plates or a series of plates from the same dilution must be added the error introduced in removing 1 cc. portions of ice cream from different samples."

In discussing the interpretation of bacterial counts, it is stated that differences in the number of bacteria per cubic centimeter should never be considered except in relation to the total count of each sample.

Studies on the production of sanitary milk, J. M. SHERMAN (*Pennsylvania Sta. Rpt. 1915, pp. 299–305*).—Brief reports are made of studies under the following headings:

I. *Some bacteriological tests of the milk clarifier.*—The milk used in the preliminary tests here reported came from the college herd and was produced

under sanitary conditions of a grade equal to that required for certified milk. Tests were made on the effect of the clarifying process on the number of bacteria, the subsequent activity of the organisms, and the keeping quality of the milk. On 15 tests the milk before clarification contained from 2,600 to 5,500 with an average of 3,640 bacteria per cubic centimeter, while the milk after the process contained from 4,900 to 10,900, with an average of 7,027 bacteria per cubic centimeter. "The increase in the number of bacteria in the clarified milk is, of course, only an apparent one and is due to the agitation of the machine which breaks up the clumps of bacteria, thus increasing the count as determined by the plate culture method."

Reduction tests were made in order to test the relative physiological activities of the microorganisms in ordinary and clarified milks. The tests were made by adding 10 cc. of milk with 1 cc. of a solution of 1 gm. methylene blue to 2 liters of physiological salt solution, and incubating at 37° C. For the determination of the reducing powers of the milks, five check samples each were run on the clarified and unclarified milks in each test. Four such tests were run, and in every case the reduction took place sooner in the clarified milk. The differences were well marked and indicated that the clarifying process actually stimulates the activity of the organisms contained in milk.

A study of the keeping quality of milk as affected by clarification showed that in each of the four samples tested the development of acid in milk held at 10° was greater in clarified than in normal milk. In these tests the clarifying process did not appear to have any hygienic significance, as evidenced by its failure to remove streptococci to a measurable extent.

II. *The significance of the udder flora in the production of high-grade milk.*—In the course of other work it has been noticed that relatively large numbers of bacteria occur in the udders of certain cows, and that the existence of such animals is more frequent than is ordinarily thought. Of 142 cows, from six different herds which have been examined, 19 have been found to give over 10,000 bacteria per cubic centimeter in their fresh milks, while in 41 cows the number of organisms exceeded 5,000 per cubic centimeter. Two of the animals mentioned gave milk containing over 100,000 bacteria per cubic centimeter. All of the cows were in normal healthy condition.

In order to show the relation of the udder flora to the bacterial content of the finished product, 12 cows of the college herd were selected, 6 of which had low numbers of microorganisms in their udders, while the other 6 harbored relatively large numbers. Three tests were made at intervals of several days of the milks from all 12 of the individual animals. The average bacterial count of the 6 low-group cows was 140 and of the 6 high-group cows 10,590 per cubic centimeter.

The milks from these two groups of cows were also collected separately for a period of 15 days. The milks from the animals of the low group were placed in one can and those from the animals of the high group in another can. All of the cows were milked by two men, each milker taking three cows from each of the two groups. The milking was done with no extra precautions, the milks then being weighed, strained, cooled, etc., in the usual way. Samples were taken after the milk had been exposed to all the handling it gets up to the bottler. The averages of the counts for the 15 days were 411 for the morning milk and 296 for the evening milk of the cows of the low group, and 11,240 for the morning milk and 7,353 for the evening milk of the cows of the high group.

III. *The normal occurrence of streptococci in milk.*—During the past year examinations for streptococci have been made of the milks from the individual

cows of the college herd. Of 48 healthy cows, showing no signs of udder trouble, streptococci were found in 15 of the individuals examined. Examinations were also made of the mixed milk from the college herd. Of 25 samples which were examined during the period of about four months all showed streptococci in relatively large numbers.

The results obtained at the station indicate "that the mere presence of streptococci in milk has little if any significance from a sanitary point of view."

Analogy between lactic ferments and streptococci, from the standpoint of the action of antiseptics, CHARLOTTE and H. CARDOT (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 7, pp. 272–275, figs. 2*).—A comparison was made of the action of different strengths of phenol and sodium fluorid upon streptococci and lactic ferments.

The results show a remarkable similarity of action of these antiseptics upon the two groups of microbes. From the strict analogy observed between the two microbes it is concluded that the results obtained from a study of the lactic ferment may be applied to pathogenic bacteria.

Butter shrinkage, E. S. GUTHRIE (*Jour. Dairy Sci., 1 (1917), No. 2, pp. 136–138*).—Tabulated data are presented showing the decrease or increase in each of 100 tubs of butter after storage for 134 days at from 0 to —10° F. The butter was made at the Cornell University creamery from eight different churnings from sweet, pasteurized cream.

Seventeen packages showed an increase in weight ranging from 0.5 to 27.5 oz. and totaling 85 oz. Eighty-three tubs showed shrinkage which varied from 0.5 to 15.5 oz. and totaled 377.5 oz. The net shrinkage was 18.28 lbs., or 0.29 per cent. The individual weighings were not checked.

The influence of salt on the changes taking place in storage butter, R. M. WASHBURN and A. C. DAHLBERG (*Jour. Dairy Sci., 1 (1917), No. 2, pp. 114–126, fig. 1*).—This is a report of studies of salted and unsalted butter held for the usual cold-storage period in a commercial cold-storage butter room, and then for a short time at the usual ice-box temperature in order to give it the treatment usually received by stored butter before being consumed.

Salt, exclusive of its antiseptic property, hastened the deterioration of the butter. When stored at —15° F., unsalted butter kept as well as salted butter. The bacteria in the unsalted butter decreased more rapidly at —15° than they did in the salted butter, but increased more rapidly at 58°. The acidity of the unsalted and the salted butter increased uniformly at —15°, but at 58° the increase was greater in the unsalted butter. Moisture was lost from the salted butter, but not from the unsalted, at —15°. Little, if any, relationship existed between the bacteria, the acidity, and the score in this butter.

Blowing renovated butter oil at pasteurizing temperature, R. H. SHAW and R. P. NORTON (*Jour. Dairy Sci., 1 (1917), No. 2, pp. 127–135*).—Renovated butter was made from a uniform grade of packing stock under factory conditions. The details of manufacture, except the blowing temperatures, were held as nearly alike as possible. Part was blown at the pasteurizing temperature, and the rest at the usual temperature. Samples were scored while fresh, and after holding three weeks in cold storage.

No differences were found that could be ascribed to the blowing temperatures. From 2.5 to 4.5 hours were required to "sweeten" the butter oil at the pasteurizing temperature, while about 15 hours were required to bring the butter oil blown at the usual temperature to the same condition, thus cutting down two-thirds of the operating time of this phase of the process.

The results of the investigation indicate that the butter oil may be blown at a temperature that will insure its pasteurization without impairing in any way the flavor, grain, or keeping quality of the finished product.

Soft cheese making, R. W. Brown and M. Mortensen (*Iowa Sta. Circ. 38 (1916), pp. 4*).—Brief directions for making Neufchatel, pimento, olive cream, sandwich nut, cream, club, cottage, and butternut cheeses.

How to make cottage cheese on the farm, K. J. Matheson and F. R. Cammack (*U. S. Dept. Agr., Farmers' Bul. 850 (1917), pp. 15, figs. 7*).—Full directions are given for making cottage cheese from skim milk on the farm, with and without the use of pepsin or rennet, in small quantities for home use and on a larger scale for marketing.

VETERINARY MEDICINE.

Veterinary obstetrics, W. L. Williams (*Ithaca, N. Y.: Author, 1917, pp. XIV+637, pls. 3, figs. 140*).—This is the first of two volumes of which the second will relate to associated diseases. This volume is based upon the work previously noted (E. S. R., 21, p. 579), which has been rewritten and rearranged upon an entirely new plan.

Report of the veterinary department for the biennial period ended June 30, 1916, J. I. Gibson (*Bien. Rpt. Vet. Surg. Iowa, 10 (1915–16), pp. 34*).—In addition to a short history of the general outbreak of foot-and-mouth disease throughout the country, by J. R. Mohler, a detailed statement of the outbreak in Iowa in 1914–15 is given, together with notes on the eradication work with hog cholera through sanitary measures, on dourine, etc.

A plea for the standardization of reports of agglutination tests, P. B. Hadley (*Jour. Immunol., 2 (1917), No. 5, pp. 463–467*).—The author, at the Rhode Island Experiment Station, proposes the following scheme for records and for publication of results of agglutination tests:

"That a complete flocculation and clearing, so that the medium becomes water-clear, be referred to as a complete agglutination, and be expressed by the symbol (C). That the last tube, beyond which no significant agglutination can be observed, be regarded as an agglutination of grade 1, and be expressed by the symbol (1). That between these two extreme grades of reaction there be recorded, if present, three intermediate grades expressed by the symbols (4), (3), (2) .... That a negative test (i. e., no appreciable agglutination) be expressed by the zero sign (0). That when no test is made in a certain dilution for a certain antigen, this circumstance be expressed by the minus sign or blank (—) .... That statements regarding the degrees of sedimentation in the control tube should always be reported in a 'control column.' That the smallest detectable quantity should be regarded as a trace of sediment, and expressed by the symbol (T). That a significant sedimentation . . . should be expressed by the symbol (S). That such a degree of sedimentation as might perhaps invalidate the test should . . . be expressed by the symbol (SS)."

It is indicated that such a system for recording and expressing results would eliminate much confusion in interpretation and render the tests of different workers comparable to a much greater degree than is possible at the present time.

Studies in anaphylaxis.—XX, The reciprocal relations of antigen and antibody within the cell.—A contribution to cellular immunology, R. Weil (*Jour. Immunol., 2 (1917), No. 5, pp. 469–499, fig. 1*).—Continuing the studies previously noted (E. S. R., 36, p. 677), data are submitted which further establish the previously made contention of the coexistence of antigen and antibody within the cell and also the influence that these two factors exert upon each other in the cell.

"When guinea pigs are passively sensitized by the injection of rabbit immune serum, quantitative studies show that the anchored, or cellular, antibody

is capable of combining with varying quantities of the antigen." The phenomenon was observed whether a complex (horse serum) or a simple (crystalline egg albumin) antigen was used, in experiments on the living animal as well as on the isolated uterus, and also with native antibody as shown in the experiments in active anaphylaxis.

"Partially combined cellular antibody manifests a marked diminution in its affinity for fresh antigen. This diminuation is inverse, but only very roughly, to the degree of saturation by antigen. Considerable variation in the amount of the desensitizing dose of antigen may produce in practically the same degree a loss of reactivity, or of avidity, toward fresh increments of antigen.

"The minimal anaphylactic dose after partial desensitization shows an enormous increase over that in the undesensitized animals. This increase can not possibly be accounted for on the theory of neutralization of part of the cellular antibody, leaving the remainder free to act. Partially saturated antibody shows not a diminished, but a qualitatively altered reactivity. Native guinea pig anti-antibody attenuates alien (rabbit's) sensitizing antibody. In relatively large amounts the former may completely abolish the reactivity of the latter; in smaller amounts it lowers the reactivity in such a fashion that very large amounts of antigen are required to induce an anaphylactic response. Partially neutralized antigen shows, not a diminution, but a qualitative alteration of its reactive function.

"The combination of cellular antibody with antigen in varying proportions suggests an analogy with colloidal reactions, or adsorption phenomena. A very essential point of difference is the specific affinity of the two reagents. . . .

"The same antibody, when in solution as precipitin, combines with antigen quantitatively, and in strictly constant proportions, to form precipitate; when attached to the cell, as sensitizing antibody, it combines with antigen in varying proportions. The living cell, therefore, modifies its properties. There is no general law governing the mode of reaction of antibody. Depending upon circumstances, it may combine with antigen according either to chemical or to physical (colloidal) analogies."

Rôle of hepatic tissues in the acute anaphylactic reaction, W. H. Manwaring and H. E. Crowe (*Jour. Immunol., 2 (1917), No. 5, pp. 517–524*).—"The detoxicating action of the anaphylactic liver is not due solely to the presence of anaphylactic humoral elements. There is evidently an acquired detoxicating function of the fixed liver cells. The detoxicating action is not due to a removal or destruction of the foreign protein in the perfusion fluid. Evidence points to the explosive formation or liberation of vasodilator and bronchodilator substances by the sensitized liver cells."

Fate of the foreign protein in the acute anaphylactic reaction, W. H. Manwaring, Y. Kusama, and H. E. Crowe (*Jour. Immunol., 2 (1917), No. 5, pp. 511–515*).—From the results obtained in the study reported, in which perfusion methods were applied to isolated organs and tissues, it is concluded that "no demonstrable destruction or binding of the foreign protein by the fixed tissues takes place during the acute anaphylactic reaction."

The influence of temperature on the fixation of complement, H. R. Dean (*Jour. Path. and Bact., 21 (1917), No. 2, pp. 193–214, figs. 8*).—Data obtained in the study show that in a mixture of antigen and antibody more complement is fixed at 0° C. than at 37°. The maximum fixation, however, is attained more rapidly at 37° than at 0°.

"If suitable proportions of antigen, antiserum, and fresh guinea-pig serum are mixed, it is possible to demonstrate that a precipitate is formed at 0°, which

dissolves at 37° and reappears if the temperature is again brought down to 0°. When antigen, antiserum, and complement are mixed, the euglobulin of the guinea-pig serum is adsorbed by the particles of the precipitate. The formation of this adsorption compound is favored by keeping the mixture at a low temperature. These observations explain the fact that more complement is fixed at 0° than at 37°.

"The formation of an adsorption compound in a mixture of antigen, antiserum, and guinea-pig serum is an essential part of the mechanism of complement fixation. Where the antigen is a cell which can be lysed, the effect of the formation of the adsorption compound is to concentrate at the surface of the cell the active or lytic component of the complement. The subsequent reaction which involves the lysis of the cell is, of course, favored by a relatively high temperature."

The data are submitted in tabular and graphical form.

Preservation of complement.—A preliminary report, B. W. RHAMY (*Jour. Amer. Med. Assoc., 69 (1917), No. 12, pp. 973, 974*).—The author has found that complement diluted to 40 per cent with 10 per cent sodium acetate in 0.9 per cent sodium chlorid solution will keep perfectly until used in ordinary routine work. A sample of guinea-pig serum so diluted, which showed a unit of 0.1, one month afterwards showed a unit of 0.125.

Anthrax in the Territory of Hawaii, V. A. NORGAARD (*Hawaii. Forester and Agr., 14 (1917), No. 6, pp. 156–165*).—An outbreak of anthrax at Hanalei, Kauai, is recorded and a general account given of the disease and directions for its control.

The susceptibility of the prairie dog to rabies, G. WALTERS (*Jour. Amer. Vet. Med. Assoc., 51 (1917), No. 5, pp. 702–704*).—The inoculation of several prairie dogs with rabies virus resulted in fairly typical symptoms, although a thorough search of the literature failed to show any previous record of rabies infection among them. Attention is called to the ease with which the disease might be spread among prairie dogs by coyotes or other enemies and thence to other animals which come in contact with them offensively.

Rinderpest in swine with experiments upon its transmission from cattle and carabao to swine and vice versa, W. H. BOYNTON (*Philippine Jour. Sci., Sect. B, 11 (1916), No. 5, pp. 215–265, pls. 2, figs. 10*).—This material has been previously noted from another source (E. S. R., 37, p. 79).

The recent outbreak of vesicular stomatitis, A. A. LEIBOLD (*Vet. Alumni Quart. [Ohio State Univ.], 4 (1917), No. 4, pp. 132–134*).—A report of observations made during the course of an epizootic outbreak of the disease, particularly among horses, though some cattle were affected, in Utah, Nebraska, Colorado, Missouri, and northern Illinois in the fall of 1916.

The sensitiveness of tubercle and other acid-fast bacilli to acids, A. E. PORTER (*Jour. Hyg. [Cambridge], 16 (1917), No. 1, pp. 66–68*).—In the study reported a very great difference in sensitiveness to both organic and inorganic acids was observed between tubercle and other acid-fast bacilli. Tubercle bacilli were killed in 24 hours by tenth-normal acid, but could resist more dilute acid, while other acid-fast bacilli were killed by $\frac{1}{10}$-normal acid. No difference could be observed between the action of inorganic and soluble organic acid upon the bacilli. A difference between soluble and insoluble fatty acids was, however, observed. If the insoluble acid was in a fine emulsion and was shaken with the bacilli bacteriolysis occurred. Acid-fast bacilli other than the tubercle, although more sensitive to lower acids, were less affected by the insoluble fatty acids. No difference was observed in sensitiveness between human and bovine bacilli.

The bacteriolytic action of gland extracts on tubercle bacilli, A. E. PORTER (*Jour. Hyg. [Cambridge], 16 (1917), No. 1, pp. 55–65*).—Lung extract was found to be the least bactericidal, while pancreas extract was found to be the most powerful. The extracts of liver, thymus, and lymphatic glands were all strongly bactericidal. Suprarenal gland, pig and cat spleen, human and cat kidney, human and ox brain, ox thyroid, cat lung, ox bone marrow, and ox pituitary gland extracts were all found to be bactericidal to a lesser degree. A human skin extract was examined for bactericidal properties and found to be exceptionally rich in esterases. It is noted that this sample of skin extract bears out the relationship between lipolysis and bacteriolysis of tubercle bacilli, since the extract was extremely bactericidal. No difference was observed between the bovine and human tubercle bacilli in susceptibility to any of the gland extracts examined.

"Other acid-fast bacilli, though on the whole less susceptible than tubercle bacilli to the influence of these extracts, were bacteriolyzed by them. They were also killed by one lung extract (pig's) which contained an unusually large amount of olein lipase and which had no effect on tubercle bacilli."

The data are presented in tabular form.

On the claimed differential characteristic of the avian tubercle bacillus, A. ROCHAIX (*Compt. Rend. Soc. Biol. [Paris], 80 (1917), No. 12, pp. 570, 571*).—Data are submitted from which the author concludes that the medium previously described,[1] consisting of agar with carrot juice, can not be used to differentiate the avian from the human and bovine tubercle bacillus as has been recently claimed by Ranjel de Morais.[2]

Vaccination against bovine tuberculosis, A. BRUSCHETTINI (*Rev. Path. Comp., No. 131 (1917), pp. 5, 6; abs. in Vet. Rev., 1 (1917), No. 3, pp. 295, 296*).—A vaccine is described which has been prepared by injecting virulent bovine bacilli (previously washed in a mixture of alcohol and ether to remove the fat) into the pleural cavity of rabbits. After 48 hours the bacilli are collected, carefully ground with quartz sand, and emulsified in an agitator with 0.5 per cent phenol solution. After the addition of ether the mixture is filtered through cotton and preserved under toluol in a refrigerator.

Eight calves were vaccinated with the preparation, five subcutaneously and three intravenously. Six months later the calves were inoculated with tubercle bacilli, four of them with the culture and the other four with an emulsion of mammary tuberculosis extremely rich in bacilli. The results obtained were so satisfactory that a practical test on a large number of animals has been recommended.

Tuberculosis in farm animals, C. L. MCARTHUR (*Arkansas Sta. Bul. 136 (1917), pp. 3–15, figs. 5*).—This bulletin briefly describes the disease in cattle, swine, and fowls; the tuberculin test; and the duration of life of the tubercle bacillus outside of the animal body.

Managing a tuberculous herd (*Iowa Sta. Bul. 172 (1917), pp. 79–90, figs. 6*).—This bulletin consists of two parts.

I. *History of the tuberculous herd at Iowa State College since 1909*, W. H. Pew (pp. 79–86).—This material has been essentially noted from another source (E. S. R., 37, p. 379).

II. *Plans for the control and eradication of tuberculosis*, C. H. Stange (pp. 86–90).—The author here briefly outlines the methods which have been proposed for the control and eradication of the disease and gives the recommenda-

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[1] Compt. Rend. Soc. Biol. [Paris], 74 (1913), No. 11, pp. 604–606.

[2] Vantajens de um novo meio vejetal de cultura. A Patolojia Geral [Rio de Janeiro], 1916, Aug.

tions of the International Commission on the Control of Bovine Tuberculosis, as previusly noted (E. S. R., 25, p. 384).

Fooling with tuberculosis, F. F. FIELD ET AL. (*Kimball's Dairy Farmer, 15* (*1917*), *No. 19, p. 746*).—The successful eradication of tuberculosis from a large herd of dairy cows in Massachusetts by the Ostertag method is reported upon. In the 3.5 years that the system was under way there were but three reactors in young animals reared in this way.

Poisoning of cattle with horse-radish, W. HACKETT (*Jour. Compar. Path. and Ther., 30* (*1917*), *No. 2, p. 138*).—The author reports upon the loss of several head of cattle from feeding upon a considerable quantity of horse-radish roots.

Poisoning of cattle with British ragwort, S. STOCKMAN (*Jour. Compar. Path. and Ther., 30* (*1917*), *No. 2, pp. 131–134*).—A report upon the loss of a large number of cattle at Northallerton from feeding upon forage containing ragwort (Senecio).

Eradicating tall larkspur on cattle ranges in the National Forests, A. E. ALDOUS (*U. S. Dept. Agr., Farmers' Bul. 826* (*1917*), *pp. 23, figs. 8*).—This publication gives the results of grubbing work in the eradication of tall larkspur on the National Forest ranges where the annual losses of cattle due to poisoning by this plant amount to about 5,000 head. The methods of operation, equipment, etc., are described. "The average cost of eradicating larkspur by grubbing probably falls between $3.65 and $4.15 per acre on range that is comparatively free from rocks, willows, and brush. For willow and rocky areas about $10 an acre probably represents the maximum cost."

Investigations into the cause of worm nodules (Onchocerca gibsoni) in cattle, C. G. DICKINSON and G. F. HILL (*Melbourne, Aust.: Govt., 1916, pp. 7*).—The work here reported has definitely excluded certain species that have been considered as possible vectors, namely, *Lyperosia exigua*, *Stomoxys calcitrans*, *Tabanus mastersi*, *T. nigritarsis*, (*Boophilus*) *Margaropus australis*, and any purely aquatic forms other than those possibly found in the bore water. See also a note by McEachran and Hill (E. S. R., 34, p. 581).

External parasites of sheep: Eradication of ticks in New Zealand, A. MATTHEWS (*Jour. Agr.* [*New Zeal.*], *15* (*1917*), *No. 2, pp. 73–78*).—A discussion of methods in eradication work with the sheep tick or ked (*Melophagus ovinus*) in New Zealand. Attention is called to the eradication of the sheep scab mite that was effected many years ago under very great difficulties, since which time there has been no return of the disease.

Hog cholera: Prevention and treatment, M. DORSET and O. B. HESS (*U. S. Dept. Agr., Farmers' Bul. 834* (*1917*), *pp. 32, figs. 13*).—A summary of information on the subject based upon the more recent investigations and demonstrations of control work carried on by the U. S. Department of Agriculture in cooperation with the State authorities. "Experiments of the Bureau of Animal Industry have demonstrated the possibility of greatly reducing the losses from hog cholera wherever farmers are willing to cooperate and take steps to prevent the spread of infection and secure the proper treatment of their herds."

On the possibility of the infection of pigs with the flukes Opisthorchis felinus, Pseudoamphistomum danubiense, and Metorchis albidus, JOAN CIUREA (*Ztschr. Fleisch. u. Milchhyg., 26* (*1916*), *pp. 323–326; abs. in Abs. Bact., 1* (*1917*), *No. 4, p. 317*).—Fish containing larvæ of *O. felineus*, *M. albidus*, and *P. danubiense* were fed to young pigs. The liver, gall bladder, and bile ducts became infested with the first two of these but not with the third.

Lepinay's treatment of mange of the horse by sulphurous anhydrid, VIGEL and CHOLLET (*Vet. Jour., 73* (*1917*), *No. 506, pp. 267–276, figs. 6*).—The authors find that in the treatment of the horse for mange sulphur dioxid is

effective, simple, inoffensive, rapid, and economical. A generator which they have had constructed is described and a claim of originality made for the procedure and its application in the treatment of mange in the horse, all the specific clinical signs of which disappear within a few days after treatment. The results obtained in the treatment of nine horses with ringworm are said to have been satisfactory. The lice and nits are radically destroyed without any recurrence by a sulphuration of 25 minutes.

Auto-inoculation and early development of the larva of the horse botfly in the buccal mucous membrane, E. ROUBAUD (*Compt. Rend. Acad. Sci.* [*Paris*], *164* (*1917*), *No. 11, pp. 453–456; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 8* (*1917*), *No. 5, pp. 757, 758*).—In experimenting with the guinea pig the author has found that the egg of the horse botfly (*Gastrophilus intestinalis* DeGeer) does not hatch spontaneously but that the larva may remain for several weeks awaiting the mechanical contact by which hatching is brought about. The larvæ which are liberated at once by mechanical contact—the mucous membrane of the tongue is not indispensable, since sharp rubbing against the animal's teeth or gums has the same effect—never perforate the epidermis but bury themselves in the epithelium and develop in the mucous membrane of the mouth. In the guinea pig the larva was observed to penetrate beneath the epithelium parallel to the surface and remain in a superficial position. One individual observed in the mucosa of the tongue had tripled in size by the ninth day. After the first molt the larvæ pass to the stomach.

Contribution to the study of epizootic lymphangitis, TRUCHE and GUIGNARD (*Bul. Soc. Cent. Méd. Vét., 93* (*1917*), *No. 3–4, pp. 64–68; abs. in Vet. Rec., 30* (*1917*), *No. 1513, p. 6*).—The author reports observations which show that galyl, a chemical product similar to salvarsan, has a valuable specific action in epizootic lymphangitis.

Investigations of a fungus (Monilia capsulata) found in the pus from a mule affected with epizootic lymphangitis, P. LINDNER and P. KNUTH (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 17* (*1916*), *No. 5, pp. 290–308, pls. 4, figs. 2*).—In infection experiments with *M. capsulata* the authors failed to produce the disease.

Intestinal parasites of poultry, their prevention and treatment, A. B. WICKWARE (*Canada Dept. Agr., Health Anim. Branch Bul. 25* (*1917*), *pp. 13, pls. 3*).—A popular discussion.

Coccidiosis of the fowl, H. H. CURSON (*Union So. Africa, Dept. Agr. Bul. 3* (*1917*), *pp. 4*).—A brief popular account of this disease, which is said to be very prevalent in the Cape Peninsula and probably in other parts of South Africa.

A means of transmitting the fowl nematode Heterakis papillosa, J. E. ACKERT (*Science, n. ser., 46* (*1917*), *No. 1190, p. 394*).—Recent experiments are said to have demonstrated that the fowl nematode *H. papillosa* may be transmitted to chickens by feeding them a dung earthworm (*Helodrilus gieseleri hempeli*). Of ten 5-week-old chicks given the dung earthworms every few days until each chick had ingested approximately 40 worms, four became infested with *H. papillosa.*

"Of 395 chickens taken locally and examined in this laboratory during the last 3 years, 293 were infected with *H. papillosa.* The average infection was 34.4 nematodes, but a single infection of 100 nematodes is not uncommon, and in one instance a fowl contained 326 of these parasites."

While the data presented indicate that the relation of the nematode to the earthworm is that of an association, in which case the eggs of the former might be carried on the slimy surface of the earthworm or in its engulfed food, the evidence is not such as precludes the possibility that this earthworm may in some way serve as an intermediate host of *H. papillosa.*

RURAL ENGINEERING.

Farm reservoirs, S. Fortier (*U. S. Dept. Agr., Farmers' Bul. 828 (1917), pp. 36, figs. 31*).—This publication gives practical information to those who intend to build or are operating farm reservoirs. The chief features of such structures are discussed, and various kinds of reservoirs adapted to the storage of water on farms are described, including reservoirs used with pumping plants, reservoirs built in beds of streams, stock-watering reservoirs, concrete-lined reservoirs, and cobblestone reservoirs. Reservoirs adapted to conditions in the Atlantic Coast States and in humid regions in general are also described.

Surface water supply of Colorado River Basin, 1914 (*U. S. Geol. Survey, Water-Supply Paper 389 (1917), pp. 198+XXXIII, pls. 2*).—This report, prepared in cooperation with the States of Arizona, Nevada, New Mexico, and Utah, presents the results of measurements of flow made on streams in the Colorado River Basin during 1914, together with the usual list of gauging stations and publications relating to water resources.

Surface water supply of the Great Basin, 1914 (*U. S. Geol. Survey, Water-Supply Paper 390 (1917), pp. 306+XXXIII, pls. 2*).—This report, prepared in cooperation with the States of Utah, Nevada, California, Oregon, and Idaho, presents the results of measurements of flow made on the Great Salt Lake, Sevier Lake, Pavant Valley, Beaver River, Salton Sea, Owens Lake, Mono Lake, Walker Lake, Humboldt-Carson Sink, Pyramid and Winnemucca Lakes, Warner Lakes, Abert Lake, Silver Lake, and Malheur and Harney Lakes basins during 1914, together with the usual list of gauging stations and publications.

Surface water supply of St. Lawrence River Basin, 1915 (*U. S. Geol. Survey, Water-Supply Paper 404 (1917), pp. 122+XXXI, pls. 2*).—This report, prepared in cooperation with the States of Minnesota, Wisconsin, New York, and Vermont, presents the results of measurements of flow made on streams in the St. Lawrence River Basin during 1915, together with the usual list of gauging stations and publications relating to water resources.

Surfact water supply of western Gulf of Mexico basins, 1915 (*U. S. Geol. Survey, Water-Supply Paper 408 (1917), pp. 111+XXVI, pls. 2*).—This report, prepared in cooperation with the States of Texas and New Mexico, presents the results of measurements of flow made on streams in the western Gulf of Mexico drainage basins during 1915, including especially the Rio Grande Basin, together with the usual list of gauging stations and publications relating to water resources.

Revenue report on the irrigation works of the Ajmer-Merwara District for the year ended March 31, 1916, C. C. Watson (*Rev. Rpt. Irrig. Works Ajmer-Merwara, 1916, pp. 25, pls. 2*).—This is a report of irrigation works, expenditures, and revenues for the district for the year ended March 31, 1916.

Revenue report of the Government of Bihar and Orissa, Public Works Department, Irrigation Branch, for the year 1915–16 (*Rev. Rpt. Bihar and Orissa* [*India*], *Irrig. Branch, 1915–16, pp. II+*[*124*]).—Data on irrigation work, revenues, and expenditures in Bihar and Orissa for the year 1915–16 are reported.

Water analysis (*Ann. Rpt. Sup. Bd. Health Prov. Quebec, 22 (1916), pp. 58–97*).—Physical, chemical, and bacteriological analyses of 422 samples of water from different parts of the Province of Quebec are reported.

Report upon the operation of a nonflush chemical closet, F. W. Ward (*Ann. Rpt. Prov. Bd. Health Ontario, 34 (1915), pp. 111, 112, fig. 1*).—Tests, conducted at the Ontario Board of Health experiment station, of a nonflush chemical closet for the use of schools and buildings are reported. The outfit

consists of a white porcelain bowl, a cylindrical iron tank of 100 gal. capacity, sufficient white enamel pipe for ventilation purposes, and 30 lbs. of an electrolytic caustic soda for chemical. The bowl is so constructed that solids do not strike the bowl, but fall directly into the tank below.

It was found by a series of experiments that 24 hours after the addition of fecal matter all traces of bacterial life had disappeared, the solids had been digested, and only a small amount of flocculent sludge was left out of solution. During the reaction a small amount of ammonia gas was given off, but the ventilation provided prevented the escape of any odor into the room. Analyses of the solution in the tank showed that in 100 gal. there were $\frac{1}{4}$ lb. of potash, $\frac{1}{3}$ lb. of phosphoric acid, and $\frac{1}{8}$ lb. of nitrogen, all in a form available as plant food. A warning is given that if a charge of chemical is not maintained this system will be a nuisance.

Chemical closets (*Pub. Health Rpts.* [*U. S.*], *32* (*1917*), *No. 26*, *pp. 1017–1020*).—In a brief statement of the advantages and limitations of chemical closets it is pointed out that "everything depends upon the sufficiency of the disinfection and the means of final disposal. No system should be installed or recommended for installation in the absence of definite and satisfactory evidence that the treatment proposed will in fact destroy pathogenic bacteria, and, in those sections of the country where hookworm disease is prevalent, the eggs and larvæ of hookworms. While the design and satisfactory operation of such a device is quite possible, its general adoption ought not to be recommended without giving the fullest consideration to the possibilities of mismanagement, and it is believed that, whatever means are adopted for final disposal, these should be so safeguarded that the almost inevitable failure at times of the chemical toilet may not result in serious danger to the health of those affected."

Sewage purification.—Decantation, H. Verrière (*Ann. Ponts et Chaussées*, *9. ser.*, *37* (*1917*), *pt. 1*, *No. 1*, *pp. 7–151*, *figs. 37*).—This is an extensive report of experiments at the Mesly experiment station in France on sedimentation as a factor in sewage purification.

Results of operation of small sewage-disposal plants, L. C. Frank (*West. Engin.*, *8* (*1917*), *No. 7*, *pp. 270*, *271*).—Experiments conducted by the U. S. Public Health Service on the operation of small sewage-disposal plants consisting of an Imhoff tank and sand bed are reported.

"Sewage was tested from two sources. The sewage subjected to the most careful test was from 25 people comprising a nurses' dormitory and one residence. . . . The sewage flow was 100 gal. per capita daily. The occasional samples of raw sewage gave an average value somewhat over 1,000 parts per million total solids and 177 parts per million for a 24-hour, at 20° C., oxygen demand. The other sewage used for testing was from 60 people in a small community in Chevy Chase, Md." The following conclusions are considered justified:

"It is possible by means of a 5-hour detention period in a properly designed Imhoff tank to remove from the raw sewage of small communities 98 per cent of the settleable solids without producing a nuisance. A mean detention period of 6 hours, based on the average daily flow, will not cause the sewage to become septic or foul-smelling if it is fresh when it enters the tank. The accumulation of a disagreeable mass of grease and fecal matters in the first compartment of the settling chamber may be prevented by the introduction of a horizontal coarse-mesh screen at the water level of this chamber. The screen keeps the floating matters submerged and apparently results in all fecal matter sooner or

later becoming water-logged and sinking through the slot into the sludge chamber.

"It is too soon to state with conviction the amount of digested sludge that may be expected from small-scale tanks, but one tank indicates an apparent accumulation of 2.6 cu. ft. per year per person, and another tank, 4 cu. ft.

"The only time when tanks required daily attention was during the foaming period, which lasted about 10 days, and during which time some of the foam had to be removed and buried. At all other times attention once a month at most was ample. Since the foaming period has been passed the scum formation has been slight.

"The decomposed sludge obtained from the small-scale Imhoff tanks resembled that obtained in large tanks except that it had a higher moisture content. This may perhaps be explained by the shallowness of the sludge layer. A 15-in. sand bed dosed with settled sewage at a net rate of 190,000 gal. per acre per day during the second summer reduced the average oxygen demand from 63 to 12 parts per million (24-hour at 20°). This is probably ample purification for many cases, but insufficient for others.

"The sand bed required little attention during the summer months, but what would seem to be a prohibitive amount of attention during the winter months, even though covered with a tongue-and-groove wooden cover. No nuisance was produced during the summer months by the dosing of the uncovered sand bed with the tank effluent. The growth of weeds on the surface did not seem to have an unfavorable effect upon the operation of the sand bed."

The management of liquid and solid manure in Belgium, H. Vendelmans (*Jour. Bd. Agr.* [*London*], *23* (*1917*), *No. 12, pp. 1208–1221, figs. 6*).—Tanks and pits for the conservation of liquid and solid manure are described and illustrated as developed by experience in Belgium.

Tanks for liquid manure are best placed immediately under the standing place of the cattle, occupying the full width and running the entire length. A depth varying from 32 in. at the shallow end to 35 in. at the outlet is considered sufficient. Walls of one thickness of solid 9-in. bricks set in cement mortar are sufficient without foundation. The floor is of bricks waterproofed with cement.

Manure pits are made to provide easy handling of the manure and shelter from sun, rain, and wind, to avoid white molds, and to improve the ripening process and hygienic conditions. A water-tight, solid manure pit of brick or cement is made against the wall of the cow house, running its entire length. The capacity is calculated on the quantity of manure produced between two successive emptyings and is varied by varying the width. The pit is sunk into the soil about 32 in. to avoid atmospheric influences.

State highway mileage and expenditures for the calendar year 1916 (*U. S. Dept. Agr., Office Sec. Circ. 74* (*1917*), *pp. 8, fig. 1*).—This circular states that "cash expenditures on the rural roads and bridges in the United States in 1916 amounted to $272,634,424. To this should be added the value of the statute and convict labor, which can not be fixed with any great degree of accuracy, but probably amounted to not less than $15,000,000, thus making the grand total expenditure for the year $288,000,000. . . . At present there are outstanding more than $400,000,000 of road and bridge bonds and long-term warrants, maturing at the rate of about $20,000,000 per year and requiring about an equal amount for the payment of interest charges. . . . More than $40,000,000 of new road and bridge bonds are now being issued annually. . . .

"The public rural roads of the United States at present have a total length of 2,455,761 miles, of which about 287,000 miles, or 11.6 per cent, are improved

with some form of surfacing. The mileage of hard-surfaced roads is increasing at the rate of about 15,000 miles per annum. During 1916 the States having State highway departments surfaced about 7,000 miles under State supervision and also improved an additional 9,000 miles by grading or otherwise. Thus, of the really constructive work of permanent improvement in the United States last year, about one-half was more or less directly under competent State supervision. In addition to this work of construction the several State highway departments also supervised the maintenance of 75,811 miles of main and trunk-line highways."

Tabular data are included on expenditures during 1916 by or under the supervision of State highway departments, on road mileage, and on cash road and bridge expenditures for the years 1904, 1914, and 1916.

Third biennial report of the Wisconsin Highway Commission 1914–15 (*Wis. Highway Com. Bien. Rpt., 3 (1914–15), pp. 329, figs. 172*).—This report covers State aid road and bridge construction in Wisconsin for the calendar years 1914 and 1915, and includes a preliminary report of similar operations in the calendar year 1916.

Standard forms for specifications, tests, reports, and methods of sampling for road materials (*U. S. Dept. Agr. Bul. 555 (1917), pp. 56, fig. 1*).—These standard forms were recommended by the first conference of State highway testing engineers and chemists at Washington, D. C., from February 12 to 17, 1917.

Dust prevention by the use of palliatives, H. B. SHATTUCK (*Ann. Rpt. Penn. State Col., 1915, pp. 153–162*).—This is a brief description of the use of fresh water, sea water, calcium chlorid, waste sulphite liquor, vegetable and animal oils, road oils, emulsions, and tar as dust preventives on roads.

"Earth roads will usually best respond to treatment with water, calcium chlorid, and light oils. Gravel and macadamized roads may be treated with these or with asphalts, emulsions of oils, and tars. Very sandy roads will be improved if a suitable amount of clay is first mixed with the sand and the whole consolidated before the application of a dust preventive. In like manner a very clayey road should be given a suitable admixture of sand to produce a better stability before the surface treatment."

Concrete in the country (*Chicago: Portland Cement Assoc., 1916, 13. ed., pp. 112, figs. 134*).—This bulletin describes and illustrates the construction of a large number of farm structures, using concrete as a building material.

Tests showing the effect of using dry and wet coal as fired in a low-pressure steam-heating boiler, J. J. LIGHT (*Ann. Rpt. Penn. State Col. 1915, pp. 148–152*).—Tests on the efficiency of a house-heating plant when fired with coal made wet and with coal as usually found in residence cellars, which can be considered practically dry, are reported.

It was concluded that "the common inference among coal consumers that an addition of water to the coal as fired is beneficial to the operation of the furnace seems false. . . . One lb. of combustible evaporates more when the coal is fired dry or as is ordinarily found in cellars of residences than when it is purposely moistened. The efficiency of the furnace throughout the tests shows that wet coal tends to decrease rather than increase operating economy."

Effect of velocity and humidity of air on heat transmission through building materials, J. A. MOYER, J. P. CALDERWOOD, and M. P. HELMAN (*Ann Rpt. Penn. State Col. 1915, pp. 55–62, pls. 6*).—Experiments on heat transmission through glass, common red brick, and diatomite insulating brick are reported.

"These data show that the transmission through glass and red brick are increased very materially with increase in humidity. Thus for glass the unit

transmission was increased 0.25 B. t. u. by increasing the humidity from 74 to 84 per cent, which is equivalent to a change of 24 per cent in transmission for a variation of 10 per cent in relative humidity. For red brick the unit transmission was increased 0.102 B. t. u. by increasing the relative humidity from 80 to 90 per cent, which is equivalent to a change of 15 per cent for a variation of 10 per cent in relative humidity.

"The effect of velocity on the transmission of heat . . . varies greatly, depending upon the arrangement for conducting the air over the surface tested. In the case of glass the unit transmission corrected to 80 per cent humidity, and at 1,000 ft. per minute velocity has these values: Two and nineteen-hundredths B. t. u. for a cube equipped with spouts; 4 B. t. u. for cube equipped with air cone alone. These facts show very conclusively that in studying the effect of velocity upon the transmission of heat through a material the arrangement of apparatus for protecting that portion of the material which is considered under still air conditions is of the utmost importance. . . .

"In the test made upon diatomite brick . . . the number of tests were small [and] no definite conclusions can be drawn, but from the results obtained the unit transmission does not remain constant, but varies directly with the temperature within the test box."

Tractor hitches and adjustments for use with power plows, C. H. Gamble (*Farm Machinery, No. 1342* (*1917*), *pp. 9, 10, figs. 5*).—Hitches and adjustments are described and illustrated.

Harvesting hay with the sweep rake, A. P. Yerkes and H. B. McClure (*U. S. Dept. Agr., Farmers' Bul. 838* (*1917*), *pp. 12, figs. 11*).—The purpose of this publication is to suggest to hay growers in the Eastern States the possibility of using the sweep rake as a means of saving time and labor. "The sweep rake consists of several long wooden teeth lying almost flat on the ground, pointed at one end and fastened to a strong framework at the other. The point frequently consists of a steel cap fitted over the end of the tooth and shaped so as to prevent it from running into the ground under ordinary conditions, yet so as to slip under the hay, no matter whether lying in piles, windrows, or swaths. The teeth usually are about 8 ft. long and placed approximately 1 ft. apart. The total width of the rake ordinarily is about 12 ft., rakes of this width having 13 teeth." Different types of sweep rake, including the wheelless, two, three, and four wheeled styles are described and illustrated.

"The use of a sweep rake in hauling hay from windrow to stack or barn under most eastern conditions can reasonably be expected to effect a reduction of 50 per cent in the cost of doing this work by the method now commonly used, i. e., pitching onto a wagon by hand and hauling to stack or barn.

"Extensive investigations of the efficiency of various methods of handling hay, made by the Office of Farm Management, show that by the latter method two men pitching onto a wagon and one man loading usually will haul from 6.5 to 8 tons of hay in one afternoon of six to seven hours. This will include putting the hay into the mow with the same crew, using hay fork or sling. A two-man crew in the same length of time, using two sweep rakes and four horses, with the average length of haul in the East, which is less than 0.25 mile, will haul to the barn and put into the mow with slings about double the amount of hay handled by the three-man crew working with a wagon. If the hay is stacked in the field, three times the amount will be handled, although the third man will be required on the stack."

Management of common storage houses for apples in the Pacific Northwest, H. J. Ramsey and S. J. Dennis (*U. S. Dept. Agr., Farmers' Bul. 852* (*1917*), *pp. 23, figs. 5*).—This publication deals with the fundamentals of con-

struction and the efficient management of common storage houses for apples under the conditions prevailing in Washington, Oregon, Idaho, and Montana.

"The efficiency of a common storage house will depend primarily upon the rapidity with which the fruit is cooled and the storage temperatures maintained. A common storage building, therefore, must necessarily provide for two things—the freest circulation and intake of cold air during the night or the cooler periods of the day and the conservation of this cold air by closing all hatches and intakes before the outside temperature begins to rise and by preventing the leakage of heat through the walls, floors, and ceilings of the building. For the intake of cold air, openings should be provided at or near the ground or the lower part of the building, while air shafts leading upward from the ceiling of the storage chamber or chambers should be provided to carry off the warm air. To prevent the leakage of heat into the building, the walls, ceilings, and floors must be insulated. As these two factors govern to a considerable extent the rapidity of cooling and the maintenance of low temperatures, the importance of ventilation and insulation can hardly be overestimated. . . . Upon these depend in the final analysis the success or failure of the common storage house."

Potato storage and storage houses, W. STUART (*U. S. Dept. Agr., Farmers' Bul. 847 (1917), pp. 27, figs. 20*).—The methods of handling potatoes in storage are discussed and the fundamental factors of the construction and management of storage houses dealt with in detail.

RURAL ECONOMICS.

Introduction to rural sociology, P. L. VOGT (*New York and London: D. Appleton & Co., 1917, pp. XVI+443, figs. 20*).—This volume covers the usual field of a book relating to rural sociology, and has paid special attention to the organization and function of villages.

The author points out that "comparatively little of the field could have been explored. Enough has been done, however, to justify definite conclusions as to certain phases of the subject, and the attempt has been made to present the more important of the conclusions reached. While many of the data are necessarily limited in scope, they are presented as a basis for further study in wider areas. It is believed they are drawn from sources which are typical of the entire agricultural area, which has been made the topic of special investigation."

The determination of the cost of production of farm crops, J. WYLLIE (*Jour. Bd. Agr. [London], 24 (1917), No. 4, pp. 403–416*).—The author defines cost of production as a figure which represents the minimum net price at which a certain crop can be sold or otherwise realize a fair return on invested capital and a reasonable remuneration for the manager of the business. He discusses in detail the cost of producing a few of the more important crops.

The diversified farm, H. M. ELIOT and H. B. KILLOUGH (*Texas Agr. Col. Ext. Serv. Bul. B–41 (1917), pp. 29, figs. 22*).—The authors have outlined the monthly labor requirements and the farm earnings of the types of farming in which cotton is the principal money crop. Their outline is based on records during the year 1915–16 from 213 farms in a number of counties in Texas.

The farm labor situation in California, R. L. ADAMS (*California Sta. [Pub.], 1917, pp. 14*).—This report describes the demand for and supply of farm laborers and methods for obtaining laborers, and discusses the relationships between employer and employee and similar phases. Model application and request blanks are included.

Food needs for 1918.—Agricultural program for the period beginning with the autumn of 1917 (*U. S. Dept. Agr., Office Sec. Circ. 75 (1917), pp. 14*).—This circular sets forth the acreage of fall wheat and rye necessary to

supply the needs of the United States, its allies, and in part the neutral countries of Europe for the next crop year. It also outlines briefly the situation with reference to other crops, fertilizers, and seed stocks.

Distribution and utilization of the garden surplus (*U. S. Dept. Agr., Bur. Markets Doc. 6 (1917), pp. 10*).—Among the methods advocated that may be used to take care of the garden surplus are canning and drying, both in the home and factories, storing for winter use in cellars and commercial warehouses, and marketing the surplus through various types of marketing organizations. The text gives a number of typical instances to illustrate the various methods advocated.

The marketing of canning club products, L. B. Flohr (*U. S. Dept. Agr., Bur. Markets Doc. 5 (1917), pp. 8*).—Among the recommendations in this publication are that there should be an informal survey of the local community, county, and State to determine the demand for the products of the canning clubs, and that this should be followed by a system of advertising by means of exhibits and the use of the local press. Markets might also be found through cooperation of town and city housewives. The publication also indicates that the products should be standardized in order to facilitate marketing.

Marketing plans used in a number of States are briefly described.

[Increase in the price of commodities], J. M. Robertson et al. (*London: Bd. Trade, 1916, pp. 20*).—This is the interim report on meat, milk, and bacon, of the committee appointed by the Board of Trade of Great Britain to investigate the principal causes of increase in the prices of food since the beginning of the war, and it contains data showing the advance in price and certain factors of cost. Recommendations looking toward furnishing a more adequate supply at a reasonable price are also included.

A big stride in agricultural improvement, J. Porter (*Hereford, England: [Author, 1917], pp. 32, figs. 2*).—The author suggests that the agricultural products of England could be greatly increased by improving the second-rate pasture land through the use of properly selected seed mixtures. He outlines systems of rotation to be followed and the constituents of various seed mixtures.

Agricultural practice in time of war, A. Cadoret (*La Pratique de l'Agriculture et l'Exploitation du Sol en Temps de Guerre. Montpellier: Roumegous & Dehan, 1916, pp. 62*).—This book contains a collection of articles relating to methods employed in France during the war in growing crops and live stock, and in obtaining the necessary labor, machinery, and animal power to carry on farming operations.

French agriculture and the war, H. Sagnier (*Assoc. Franç. Avanc. Sci., Confs., 1915–16, pp. 150–155, figs. 5*).—In this article are discussed the supply of wheat and its price, number of live stock, the labor situation, and the use of artificial motive power in agriculture.

Third annual report of the Cooperative Organization Branch [Saskatchewan], 1916–17, W. W. Thomson (*Saskatchewan Dept. Agr., Ann. Rpt. Coop. Organ. Branch, 3 (1917), pp. 46, figs. 9*).—This report gives statistical summaries of the business transactions during the year, and special reports with reference to wool and poultry marketing, cooperative creameries, hail-insurance commissions, and the trading department of the Saskatchewan Grain Growers' Association.

Reports of the Irish Agricultural Organization Society, Limited, 1915 and 1916 (*Rpt. Irish Agr. Organ. Soc., 1915, pp. 155; 1916, pp. 163*).—These reports continue the information previously noted (E. S. R., 33, p. 593) by adding data for the period from July 1, 1914, to March 31, 1916.

A handbook of Louisiana, H. D. Wilson (*Baton Rouge, La.: State Bd. Agr. and Immigr. [1917], pp. 211, figs. 82*).—This handbook points out general and

agricultural features, together with crops that can be grown, and gives a brief description of the climate, health, education, industries, railroads, watercourses, and forestry conditions in each of the parishes.

Maine farms for sale, 1915 (*Augusta, Me.: Dept. Agr.* [*1916*], *pp. 54, pls. 14*).—This publication contains a brief description of the type of agriculture found in that State, together with a descriptive list of farms for sale.

Tennessee, the land of great farming opportunities.—Facts about soil, climate, and rainfall (*Nashville, Tenn.: Dept. Agr.* [*1917*], *pp. 69, pl. 1, figs. 50*).—The soil types, climatic conditions, and crop and live stock situations in the State are described.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt., 3* (*1917*), *No. 9, pp. 81–92, fig. 1*).—This number contains the usual statistical data with reference to the estimated crop conditions, the estimated farm value of important crops, together with the range of prices of agricultural products at important centers. There are also special reports with reference to wheat differentials; cotton and wool production; hemp acreage; Canadian wheat, hay, and dairy products; honey production; the production of apples and rice by varieties; and the commercial acreage and production of fall onions, together with special reference to beans, Kafir corn, broom corn, cabbage, and crops in Florida and California; etc.

[Agricultural statistics of Kansas] (*Bien. Rpt. Kans. Bd. Agr., 20* (*1915–16*), *pp. 367–742*).—These pages give the usual data regarding the assessed valuation on property, number and value of live stock, acreage, and production and value of farms, together with data derived from the State census of 1915, showing by counties the nativity, State where born, number of children of school age, and military and voting ages, together with the number of persons engaged in all occupations and in agriculture.

[Agricultural crops of 1916] (*Landw. Jahrb. Schweiz, 31* (*1917*), *No. 2, pp. 121–267*).—This is a report on an inquiry into the production of crops for the year 1915–16, the cost of production, and the value, for the purpose of learning the profitableness of Swiss agriculture during that year.

The economics of a Deccan village, H. H. Mann (*Indian Jour. Econ., 1* (*1916*), *No. 4, pp. 409–433; Agr. Jour. India, 12* (*1917*), *No. 3, pp. 446–465*).—The author describes the soil types found, sources of water, use of the land, number of landholders, and size of holdings and indebtedness of the operators. Details are also given regarding the various agricultural practices of the community.

AGRICULTURAL EDUCATION.

Agricultural and mechanical colleges, 1914–15 (*Rpt. Comr. Ed.* [*U. S.*], *1915–16, II, pp. 321–352*).—This is a compilation, from official sources, of statistics of land-grant colleges with reference to faculties, students, courses of study, value of funds and equipment, revenues, additions to equipment, disbursements of Federal funds, etc.

Negro education (*U. S. Bur. Ed. Buls. 38* (*1916*), *pp. XIV+423, pls. 42, figs. 15; 39* (*1916*), *pp. V+724, pl. 1, figs. 33*).—This is a study of the private and higher schools for colored people in the United States, prepared in cooperation with the Phelps-Stokes Fund.

The first volume discusses the various phases of negro education, seeking first to present conditions as they are and then to outline means and methods for the increase of educational facilities and the betterment of the various types of educational activities under consideration. It includes an account of the origin and financial status, administration and control, educational organiza-

tion, and needs of the land-grant or State agricultural and mechanical schools, of which there are 17 for negroes in the Southern States. All of these institutions receive appropriations under the acts of Congress of 1890 and 1907, but only those of Kentucky, Mississippi, South Carolina, and Virginia receive any portion of the funds appropriated under the act of 1862.

It is found that "though preparation for rural life is much more important to the colored people than either literary or trade courses, the instruction in agriculture is the least effective of all the work offered. Most of the schools have large farms and some equipment, but very few of them are making educational use of either land or equipment. Very few pupils are specializing in agriculture in any of the 16 institutions [not including Hampton], and only 38 teachers and workers are devoting their time to agricultural instruction." The efforts of these institutions to conform to the purposes of the land-grant acts are stated to have been seriously hindered by at least three conditions, viz, inadequacy of State funds needed to administer the institution as well as to maintain courses for the general instruction of the pupils; the strong desire of the colored people for literary education and the indifference of many of their leaders to both industrial and agricultural instruction; and the necessity of maintaining elementary grades.

There are also 16 State schools, smaller than the land-grant institutions, which are primarily teacher training schools with provision for courses in the theory and practice of gardening. Of 56 schools, supported largely by private funds, there are 2 large schools (including Hampton Agricultural Institute) offering 4-year courses in agriculture, 22 smaller schools offering some class theory and farm practice, 18 schools offering class theory, but farming on a commercial basis, and 14 schools giving no instruction, but farming on a commercial basis. The 26 county training schools recently organized through the cooperation of the public authorities and the private boards all teach gardening and other activities necessary to rural life.

The second volume presents a detailed statement of the facts pertaining to colored schools which have been obtained through personal visits to institutions, from the reports of State departments of education, and from the United States census. Each of the Southern States is represented by a separate chapter which treats of the school facilities in the State, including public appropriations and private financial aid, school attendance of colored children, facilities for elementary, secondary, and collegiate industrial and agricultural education, teacher training, supervision, and summary of educational needs, followed by a description of every private and higher school arranged alphabetically by counties and cities, for which any information was available. The private colored schools of the Northern States are grouped together in a final chapter.

The work of the Agricultural Instruction Act (*Agr. Gaz. Canada, 4 (1917), No. 8, pp. 647–649*).—A brief summary is given of the objects of the Agricultural Instruction Act of 1913 and the work that has been undertaken in each Province, together with statements of the appropriation to each Province and the work to be undertaken by each during the fiscal year ending March 31, 1918. In the four years that the act has been in operation it has contributed a total of $3,400,000 to the Provinces. With the year 1917–18 the grants reach their maximum of $1,100,000 a year to continue until the expiration of the act on March 31, 1923.

Historical notes on the agricultural schools in Quebec, J. C. CHAPAIS (*Rev. Canad., n. ser., 17 (1916), Nos. 4, pp. 337–367; 5, pp. 426–446; 6, pp. 520–537*).—Historical notes are given on 17 schools of agriculture founded in the Province of Quebec. The first of these schools was established in 1670, but only three of

them are now in existence, viz, the School of Agriculture of Sainte-Anne-de-la-Pocatière, founded in 1859, the Oka Agricultural Institute at La Trappe, founded in 1893, and the Macdonald College of Agriculture, founded in 1907.

Agricultural equipment in public schools, J. E. McLarty, R. P. Steeves, J. B. Dandeno, A. W. Cocks, and J. W. Gibson (*Agr. Gaz. Canada, 4 (1917), No. 8, pp. 699–705, figs. 3*).—Suggestions with reference to equipment necessary for agricultural instruction in the public schools are given by officials in charge of such instruction in the Provinces of Prince Edward Island, New Brunswick, Ontario, Saskatchewan, Alberta, and British Columbia.

School agriculture and community service, F. E. Heald (*Training School Quart., 4 (1917), No. 2, pp. 128–130*).—The author, who is working in collaboration with H. C. Hoover, suggests a plan for making school agriculture count in community food production. The plan includes two charts, dealing with a district survey of different phases of farming and with the development of home project work, respectively.

The home-school garden, C. W. Pugsley (*Agriculture [Nebr.], 16 (1917), No. 8–9, pp. 296–300, 328; Nebr. Col. Agr. Ext. Bul. 43 (1917), pp. 12, figs. 9*).—This bulletin contains an account of the organization and development of the Nebraska home-school garden plan, which is the outgrowth of the school garden work begun in Lincoln in 1915 and the boys' and girls' club work conducted by the extension department of the Nebraska College of Agriculture.

The extension service and the State school board each furnish a full-time supervisor with the idea of giving each student enrolled some personal attention. School credit is given for the work. The extension service also furnishes assistance in the organization of the work by supplying record books, blanks, etc., interesting the children and adults of the community by means of illustrated lectures and demonstrations in canning vegetables and fruit, etc.

The garden supervsisor should ordinarily be the teacher of agriculture in the high school, but other qualified persons may be chosen for this place. A garden market, patterned after the public markets of Europe and some of the eastern cities and located usually on a vacant lot in the central part of the town, should be established in towns where there is difficulty in disposing of the products.

During the 1916 season 25 towns carried on the work, and it is estimated that this number will reach 50 in 1917.

Corn growing: A manual for corn clubs, A. W. Nolan and J. H. Greene (*New York and Chicago: Row, Peterson & Co., 1917, pp. 80, figs. 11*).—This is the first of a series of booklets entitled Home Project Series, the object of which is to make as practical as possible some of the principles of scientific agriculture for the boys and girls in the public schools and to give direct vocational value to such work. The plan is to give an outline of one project in each booklet, including project directions, practical exercises for laboratory work, subject matter for study and recitation, and notebook forms for accounts and records. It is suggested that one or two of these projects could well be taken as the basis for a year's school work in elementary agriculture.

This booklet deals with the subject of corn growing in the manner described.

School entomology, E. D. Sanderson and L. M. Peairs (*New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1917, pp. VII+356, figs. 233*).—This book, which has been prepared for secondary schools and agricultural short courses, treats of general and economic entomology, the latter including insects affecting man and domestic animals, household goods and stored food products, field crops, gardens and orchards, and methods of control. A list of references to literature on injurious insects is appended.

Vegetable gardening and canning: A manual for garden clubs, A. W. Nolan and J. H. Greene (*New York and Chicago: Row, Peterson & Co., 1917, pp. 96, figs. 13*).—This manual for garden clubs comprises a garden project calendar, the outlines for 10 practical exercises, instructions for vegetable gardening, including the preparation of products for market, care of food and methods of canning, a model constitution and by-laws for organizing a club, hints and suggestions for parliamentary practice, garden rules, recommendations concerning companion and succession crops for the home garden, a list of home gardening publications, and a form for a student's notebook on vegetable gardening and canning.

Suggestions for food conservation (*St. Louis: Women's Cent. Com. on Food Conserv., 1917, pp. 100, fig. 1*).—This booklet contains suggestive notes taken from the lecture course given in the Normal Training School of Food Conservation held under the auspices of the Women's Central Committee on Food Conservation in St. Louis in May, 1917. The notes deal with the following subjects: Woman as a buyer in general, food distribution in the United States, overhead costs—how women can help themselves by helping to reduce these costs now, food protection in commercial handling, classification of food principles and measurement of food values, meals and their substitutes for war purposes, division of income—budget and expenditures, the processes of digestion, substitutes, adulterations, preservatives, misleading labels, laboratory tests, avoidance of diversion of foodstuffs, storage in cave and cellar, canning fruit and vegetables, practical demonstration on home drying of foods and on the packing of eggs, and emergency recipes now being used in the St. Louis food conservation schools.

Three short courses in home making, Carrie A. Lyford (*U. S. Bur. Ed. Bul. 23 (1917), pp. 104, figs. 21*).—This bulletin contains simple and definite outlines of three short courses in home making for the elementary rural schools. The courses consist of 20 lessons each in the care of the home, cooking, and sewing, together with suggestions to the teacher, and lists of necessary equipment and textbooks on these subjects. It is recommended that periods of at least 40 minutes be provided for all of the practical lessons, while a 30-minute period is deemed sufficient for a lesson without practical work. A list of books bearing upon home economics or on methods of teaching is suggested for a rural school library.

The biology of the bird, J. F. Bovard (*Eugene, Oreg.: Ext. Div. Univ. Oreg., 1917, rev., pp. 235, figs. 202*).—This is a series of 17 correspondence lessons offered by the extension division of the University of Oregon on the biology of the bird. Each lesson is accompanied by review questions. References for reading are suggested and directions given for field work with birds.

Prepare for war on insects (*New Bethlehem, Pa.: New Bethlehem High School [1917], pp. 17*).—This book has been prepared for the farmers and truck growers of Clarion County, Pa., by the sophomore class of the New Bethlehem (Pa.) High School. It gives in condensed form the common name, a short description, and means of control, prevention, and remedies of the insect enemies and plant diseases of farm crops, truck garden plants or vegetables, and live stock.

War emergency propaganda in the interest of poultry husbandry, H. R. Lewis (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 3 (1917), No. 10, pp. 73–76, 77*).—A summary is given of the results obtained from an inquiry sent to over 150 men engaged in educational, extension, and research work in poultry husbandry in the United States and Canada, as to measures which are being specially emphasized to promote the production of poultry and eggs

to meet the present war emergency conditions, the lines of work found most beneficial in the State, methods by which the measures are being promoted and developed, and the estimated effect of the present conditions of labor and feed on poultry production in the State.

Illustrated lecture on cow testing and dairy records, D. STUART (*U. S. Dept. Agr., States Relat. Serv. Syllabus 30 (1917), pp. 10*).—This syllabus, prepared by direct cooperation between the Bureau of Animal Industry and this Service, gives instructions for testing cows and keeping dairy records. It is designed to aid farmers' institute and other extension lecturers. A list of 40 lantern slides to illustrate the lecture is appended.

Report of committee on education: Instruction in farm machinery, F. A. WIRT (*Trans. Amer. Soc. Agr. Engin., 10 (1916), No. 1, pp. 104–114*).—This is the result of a study, through questionnaires and letters, of the subject matter and method of presentation of the first college course in farm machinery, together with a recommendation by the committee of the best method of handling such a course.

Short-course instruction in gas engines and tractors, L. F. SEATON (*Trans. Amer. Soc. Agr. Engin., 10 (1916), No. 2, pp. 146–149*).—This paper has been previously noted (E. S. R., 36, p. 400).

College instruction in concrete construction, A. J. R. CURTIS (*Trans. Amer. Soc. Agr. Engin., 10 (1916), No. 2, pp. 156–160*).—The author describes an essentially practical, rather than scientific, course in concrete, suitable for college agricultural engineering classes, without any attempt to make suggestions suitable for civil-engineering classes. His chief problem is to eliminate all but the essentials of theory and practice directly applicable to rural concrete work owing to the limited time allotted to this subject in the agricultural engineering curriculum.

MISCELLANEOUS.

Thirty-fourth Annual Report of New York State Station, 1915 (*New York State Sta. Rpt. 1915, pp. 1012, pls. 61, figs. 47*).—This contains the organization list; a financial statement as to the Federal funds for the fiscal year ended June 30, 1915, and as to the State funds for the fiscal year ended September 30, 1915; and reprints of Bulletins 394–413, Technical Bulletins 40–46, Circulars 33–46, and popular editions of Bulletins 394, 396–400, 402, 406, 409, 411, and 412, all of which have been previously noted.

Annual Report of Pennsylvania Station, 1915 (*Pennsylvania Sta. Rpt. 1915, pp. 528, pls. 100*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1915, a report of the director on the work and publications of the station during the year, departmental reports, and many special articles abstracted elsewhere in this issue.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta., Mo. Bul., 5 (1917), No. 6, pp. 78–92, fig. 1*).—This number contains brief articles on the following subjects: Making Silage, by H. L. Blanchard; Preparing for Fall Seeding, by E. B. Stookey; Harvesting and Storing Vegetables for Winter, by J. L. Stahl; Poultry Feeding Problems, by Mr. and Mrs. G. R. Shoup; Feeding Straw, by W. A. Linklater; and Pickles, by Mary E. Sutherland.

Federal legislation, regulations, and rulings affecting agricultural colleges and experiment stations (*U. S. Dept. Agr., States Relat. Serv. [Pub.], 1917, pp. 56*).—A revision to July 15, 1917, of the circular previously noted (E. S. R., 36, p. 598).

NOTES.

Alabama Canebrake Station.—The station is contemplating the establishment and development of a dairy herd, using a pure-bred Jersey bull and grade Jersey cows. The object will be to demonstrate to farmers of the region how to begin in dairy farming.

Arkansas University and Station.—Special instruction courses for extension workers were held from December 10 to 22, 1917, and a course specially designed to meet the needs of home demonstration agents, including English, gardening, dairying, rural sociology, poultry work, rural social engineering, household conveniences, rural recreation, sanitation, home nursing, care of infants, etc., from January 7 to February 2, 1918.

Dr. G. L. Caldwell, assistant veterinarian, resigned November 1 to accept a commission in the Veterinary Corps of the Army Medical Department and has been succeeded by Dr. C. B. Olney. Dr. C. L. McArthur, bacteriologist, resigned November 25 to become assistant professor of bacteriology and assistant bacteriologist for the Oregon College and Station.

Delaware College and Station.—Dr. D. C. Dyer, chemist in the Dairy Division of the U. S. Department of Agriculture, has been appointed chemist in the station to succeed Firman Thompson, who was transferred January 28 to the chemical department of the college and will devote his entire attention to teaching. Miss Helen Updegraff has been appointed to succeed A. C. Whittier, resigned as associate chemist, and Miss Phyllis Lapham has been appointed research assistant in the animal husbandry department.

Georgia College.—A feature of the annual short course in January was the food conservation school for farm women. County demonstration and home economics agents who have recently taken up work in the extension department were also present at these courses.

Ira W. Arthur, W. H. Howell, and G. R. Skinner have resigned their positions in the animal husbandry department to enter Army service.

Purdue University and Station.—In response to the demand for information and experimental work in truck crops, W. A. Huelsen has been added to the station staff as assistant in horticulture. D. C. Kennard has been appointed instructor in poultry husbandry and assistant poultry husbandman.

Kansas College and Station.—The seed testing laboratory has been transferred from the botany to the agronomy department. Mrs. Elizabeth P. Harling has been appointed seed analyst, vice Robert Schmidt resigned to accept a position in the Officers' Reserve Corps.

Dr. Albert G. Hogan, assistant in animal nutrition, has accepted a position in the Sanitary Corps of the Army Medical Department as nutritional expert and has been given leave of absence from December 1, 1917. W. E. Tomson, in charge of dairy manufactures, has accepted a position as field agent in dairying at the Montana College, effective November 1. F. S. Merrill, of the horticultural department, has resigned to accept a commercial position.

An arrangement has been made whereby C. M. Vestal, of the department of animal husbandry, and J. I. Thompson, of the University of California, are exchanging services for the present year.

Louisiana University.—Beginning in 1917–18, all woman candidates for the academic degree in the university will be required to take two 1-term courses in home economics.

Massachusetts College.—The college is requesting a State appropriation of $100,000 for the development of women's work at the institution, $70,000 being for a women's building and $30,000 for maintenance until November 30, 1920. This proposal is regarded essentially as a war measure in view of the recent development of women's interest in agriculture, the emphasis being laid upon the importance of food thrift in the war, and the growing demand for the training of women for positions in social service in connection with country life, such as community nurses, directors of recreation, Y. W. C. A. secretaries in the country, and similar positions.

Nebraska University.—Chancellor Samuel Avery has been granted leave of absence from February 1 until September 1 for war service. T. T. Thorson, instructor in dairy husbandry, resigned in February to take up county agent work in Iowa.

New Jersey College and Stations.—A plant for the curing and drying of meat is to be erected on the college farm. The structure will consist of two fireproof and two waterproof compartments, one to be used for the slaughtering of animals and the other for the curing and storing of meat. There will also be a small compartment for smoking meats. This plant will provide facilities for instructing students in the long and short courses in agriculture in home butchering, which will be given due attention this winter as a part of the campaign for the conservation of foodstuffs.

In cooperation with the commission on mechanical power of the New Jersey State Chamber of Commerce, the stations have conducted a 3-day tractor demonstration at Plainsboro. The demonstration attracted wide interest among the farmers of New Jersey and the adjoining States, it being estimated that about 2,000 persons were in attendance.

Frank Helyar has been appointed director of short courses and associate in station administration. Julian Miller, extension specialist in fruit growing, and L. K. Wilkins, assistant in soils, have resigned. D. J. Kay, assistant chemist, L. G. Gillam, extension specialist in fruit growing, F. P. Schlatter, research assistant in cranberry investigations, David Schmidt, assistant in horticulture, and O. C. Schultz, research assistant in plant physiology, are now in military service.

North Carolina College and Station.—A new tobacco disease caused by bacteria and which spreads so rapidly during rainy weather that it has been given the name of "wild fire," has been isolated. According to preliminary reports made on this disease in August, it first appears as small, circular, yellow spots with point-like brown centers. The spots rapidly enlarge to about 0.5 in. or more in diameter and become dead and brown with a broad, yellow border. When the spots are numerous they fuse, causing large areas of the leaf tissue to become dry. These dead areas either remain in place or rot out, causing the leaf to be ragged and torn. The disease is very different from frog-eye and seems to begin in the plant bed. Studies are now being made of its origin, means of spread, etc.

A noteworthy revival of community fairs in the State the past season is reported. Station and extension workers have devoted considerable time to judging and organizing at these fairs. More than 150 community fairs, 30 county fairs, 6 district fairs, several negro fairs, and the State fair have been held, most of them giving much attention to food production and conservation.

Cheese making is beginning to be a valuable industry in the State. It is reported that the 18 factories now in operation are selling about $10,000

worth of cheese per month. D. R. Noland has been appointed to assist in organizing farmers in the mountain region.

J. E. Eckert has been appointed assistant entomologist in field work and nursery inspector in the station, vice S. C. Clapp. W. Kerr Scott has been appointed assistant in club work.

Oklahoma College and Station.—G. P. Plaisance, chemist in the station, has resigned to accept a commercial position and has been succeeded by Dr. C. T. Dowell. D. A. Spencer, assistant professor in animal husbandry and assistant animal husbandman, has resigned to accept a position with the Bureau of Animal Industry of the U. S. Department of Agriculture.

Oregon College and Station.—A training course for teachers of vocational work has been established at the college by the State Board for Vocational Education.

Among the best attended courses in the annual short course work were a grain grading course to enable farmers and warehousemen to classify and grade their products for bulk handling and a farm tractor course to enable farm laborers to operate and care for farm power machinery.

Because of the scarcity and high price of lead arsenates, the department of entomology is recommending the use of calcium arsenate as an insecticide. It is requiring, however, that commercial preparations be submitted to the department of agricultural chemistry for analysis.

Dr. L. A. Rufener, assistant professor of rural economics and sociology, has resigned to become expert economist for the United States War Trade Board.

Pennsylvania College.—F. D. Crooks, instructor in poultry husbandry, and E. J. Kepler, assistant in botany, have resigned effective January 21 and January 1, respectively.

South Carolina College and Station.—H. G. Lewis has been appointed assistant professor of soils and chemistry and assistant chemist in the station. W. E. Hunter, graduate assistant in botany, has joined an officers' training camp. H. E. Shiver, assistant in chemistry, has volunteered for the Aviation Corps.

South Dakota College.—It is announced that the faculty and the students voluntarily agreed to sacrifice nearly a week of the Christmas recess, give up rest days between the semesters, and go to classes on Saturdays, in order to shorten the school year and close early for farm work. About five weeks is expected to be gained in this way.

Utah Station.—Scott Ewing has been appointed assistant meteorologist, vice N. E. Edlefsen who has become county agent for Emery County.

Vermont University and Station.—Through a revision of the general statutes of the State, effective February 1, oversight of the station has been placed in the hands of the executive committee of the board of trustees of the university, acting as a board of control. This replaces the board consisting of the president of the university, ex officio, and two trustees, which for 30 years has directed its work. Ex-governor E. J. Ormsbee, who has been a member of the board since 1886, retired under this change. Edwin W. Lawrence, of Rutland, has been appointed a trustee of the university to succeed Redfield Proctor, who has resigned to enter the U. S. Army.

L. H. Burgwald has been added to the staff of dairy instructors in the extension service, and Miss Bertha Holden has been appointed instructor in home economics. J. F. Sturtevant, sheep specialist, is to divide his time between the extension services of Vermont and New Hampshire.

Virginia Station.—W. G. Harris, associate chemist, has been granted leave of absence to enter Army service.

Virginia Truck Station.—J. A. McClintock has resigned as plant pathologist to become extension pathologist in charge of cotton, truck, and forage crop diseases in Georgia for the Bureau of Plant Industry of the U. S. Department of Agriculture, with headquarters at Athens, Ga.

Washington College and Station.—It is announced that W. J. Spillman has decided not to accept the position of dean of the college of agriculture and director of the station, to which he was recently elected.

Dr. J. S. Caldwell has resigned as physiologist of the station to accept an appointment as physiologist in charge of the fruit and vegetable utilization laboratories of the U. S. Department of Agriculture. F. W. Allen, assistant horticulturist, has resigned to accept a position with the Bureau of Markets of the Department. E. G. Woodward, associate professor of dairy husbandry and assistant dairy husbandman at the Nebraska University and Station, has been appointed dairy husbandman, beginning January 1. Dr. F. D. Heald has been appointed head of the newly-established department of plant pathology, and Anthony Spuler, assistant entomologist.

Wisconsin University.—It is announced that seniors drafted or enlisted in the Army or Navy during the current year are to receive their degrees in June. Other students withdrawing for this service will receive college credit. Albert J. Roush has been appointed assistant professor of agricultural engineering.

Wyoming University and Station.—J. L. Robinson, assistant agronomist, has entered a reserve officers' training camp.

States Relations Service.—C. H. Lane, for several years chief specialist in agricultural education, has been transferred to the Federal Board of Vocational Education as field agent for agricultural instruction in the Southern States, with headquarters at Atlanta, Ga. F. E. Heald is now in charge of the work of agricultural instruction in schools in this Service. H. P. Barrows, specialist in agricultural instruction for several years, has accepted an appointment as professor of agricultural education in the Oregon College. J. D. Blackwell, for several months assistant in agricultural education, has become director of vocational agriculture for the State of Texas with headquarters at Austin.

R. W. Trullinger, for several years in charge of the abstracting for *Experiment Station Record* in rural engineering and associated with that in soils and fertilizers, has been commissioned first lieutenant in the Ordnance Reserve and has been called into active service.

Experiment Station in Santo Domingo.—An executive order of December 24, 1917, establishes an experiment station in Santo Domingo under the direction of the Department of Agriculture and Immigration. A tract of land has been selected about 10 miles west of the capitol and the work of clearing the land and preparing for the erection of buildings has begun. An appropriation of $5,500 is available for these purposes. It is announced that special attention will be given to live stock with a view of improving the herds of the island.

Holger Johansen, formerly of the St. Croix Experiment Station and recently connected with the Porto Rico Federal Station, has been appointed director.

Agricultural mobilization in Portugal.—A degree has been passed by the Portuguese Government regarding agricultural mobilization, to be effective for two years after the close of the war. The object is to organize an active propaganda for increasing cultivation, provide agricultural syndicates and rural postal savings banks, and furnish farmers with information regarding the best farm practice as to fertilizers, cultural methods, seeds, etc. The primary purpose is to promote the cultivation of food products of prime necessity, and the power is conferred to make this obligatory.

Under the decree, means of acquiring motor machinery and other farm implements will be placed at the disposal of farmers who need them. Fertilizers and seeds will be furnished when necessary, to be paid for immediately or at harvest time. Funds and free technical assistance will also be supplied to those who cultivate new land, land rented by the Government, or land requisitioned when its proprietors do not develop it.

Prizes are to be offered and other means provided for maintaining and developing the breeding of cattle. The ministry of labor may obtain the cattle and other material necessary to assist agriculture and may also utilize cattle belonging to the Government.

To carry on the work a special department is established, provisionally in the ministry of labor, called the department of agricultural mobilization, with consulting commissioners and delegations in various parts of the country composed of agricultural engineers, farmers, agricultural syndicates, and associations. A permanent fund of 100,000 escudos (about $50,000) is put at the disposal of the ministry of labor to initiate the work.

War Emergency Board of American Plant Pathologists.—At the recent meeting of the American Phytopathological Society of Pittsburgh, Pa., a war emergency board was established. The country has been divided into six districts with a member of the board assigned to each district and with special duties in addition, as follows: Northeast, H. H. Whetzel, chairman, education (college and extension work); central east, F. D. Kern, man power census and publicity; Southern States, H. W. Barre, southern problems and needs; North Central States, G. H. Coons, fungicides and machinery, supplies and prices; great plains, E. C. Stakman, emergency research; and Western States, H. P. Barss, western problems and needs. A seventh member, G. R. Lyman, is designated as commissioner at large in connection with a plant disease survey and crop loss estimates being made by the U. S. Department of Agriculture.

Miscellaneous.—At the eleventh annual meeting of the American Society of Agricultural Engineers, held at Chicago, December 27 to 29, 1917, officers were elected as follows: President, Daniels Scoates of the Mississippi College; vice presidents, E. B. Sawyer and I. W. Dickerson; and secretary-treasurer, H. C. Ramsower of the Ohio State University.

George E. Day, head of the animal husbandry department of the Ontario Agricultural College, resigned January 1 to become secretary of the Dominion Shorthorn Breeders' Association.

Charles F. Baker has been appointed dean of the college of agriculture of the University of the Philippines.

THE AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES.

U. S. DEPARTMENT OF AGRICULTURE
STATES RELATIONS SERVICE
A. C. TRUE, DIRECTOR

Vol. 38 FEBRUARY, 1918 No. 2

EXPERIMENT STATION RECORD

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GOVERNMENT PRINTING OFFICE
1918

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MICHIGAN—*East Lansing:* R. S. Shaw.[1]
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Fruit Station: *Mountain Grove;* Paul Evans.[1]
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NEW MEXICO—*State College:* Fabian Garcia.[1]
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Cornell Station: *Ithaca;* A. R. Mann.[1]
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State College: Institute of Animal Nutrition; H. P. Armsby.[1]
PORTO RICO—*Mayaguez:* D. W. May.[2]
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Norfolk: Truck Station; T. C. Johnson.[1]
WASHINGTON—*Pullman:* Geo. Severance.[4]
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WISCONSIN—*Madison:* H. L. Russell.[1]
WYOMING—*Laramie:* A. D. Faville.[1]

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[1] Director. [2] Agronomist in charge. [3] Animal husbandman in charge. [4] Acting director.

EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Chief, Office of Experiment Stations.*
Assistant Editor: H. L. Knight.

EDITORIAL DEPARTMENTS.

Agricultural Chemistry and Agrotechny—E. H. Nollau.
Meteorology, Soils, and Fertilizers {W. H. Beal. J. D. Luckett.
Agricultural Botany, Bacteriology, and Plant Pathology {W. H. Evans, Ph. D. W. E. Boyd.
Field Crops {J. I. Schulte. J. D. Luckett.
Horticulture and Forestry—E. J. Glasson.
Economic Zoology and Entomology—W. A. Hooker, D. V. M.
Foods and Human Nutrition {C. F. Langworthy, Ph. D., D. Sc. F. Powdermaker.
Zootechny, Dairying, and Dairy Farming {D. W. May. M. D. Moore.
Veterinary Medicine {W. A. Hooker. E. H. Nollau.
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LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

U. S. Department of Agriculture—Con.

U. S. Department of Agriculture—Con.

[1] Printed in scientific and technical publications outside the Department.

EXPERIMENT STATION RECORD.

Vol. 38. February, 1918. No. 2.

For the first time in history the United States, along with several others of the allied countries, has drawn up a working program for agriculture, to secure adequate production. This is one of the many unusual features growing out of war conditions, and particularly of our relations and responsibilities to the allied countries. The new memorandum, issued by the Department of Agriculture in February, supplements the one published in August of last year relating mainly to cereals.

Like most of the measures in this country pertaining to food production, this is not a prescribed program but comes in the form of a carefully weighed suggestion as to the needs and the means of meeting them. It is voluntary, of course, but it is hoped that it may serve to give general direction to the season's campaign and stimulate efforts in the lines in which they are most desirable. Its appeal rests primarily on the necessity of the situation, and the understanding of agriculture's part in the great war.

In a word, the outline is "a statement of conclusions concerning the agricultural situation and the planting needs. . . . It is offered as a recommendation for those engaged in crop and animal production, especially for the many farmers who are in a position to readjust their agricultural program in accordance with the national necessities." In the main it is general rather than specific, except for wheat, and it is considerate of farming conditions and specialized branches. It is in no sense an office program made up on statistical and theoretical considerations, but it embodies the judgment and suggestion of agricultural leaders throughout the country. The needs and the possibilities have been viewed in the light of the conditions which prevail at this time. It is designed therefore as both practical and practicable, barring untoward developments of the season. It is therefore something to work to, and to join hands in seeking to attain.

While the situation is such that chief emphasis is laid on the production of the great staple food products, with special stress on

wheat and hogs, the outline summarizes the aims for securing sufficient cereals of various kinds, meat and dairy products, sugar, cotton, and other products for the Nation, its armies, and its Allies. It will furnish the basis for personal appeal and guidance throughout the country, but it differs radically from the programs of some of the European countries in its lack of provision for enforcement or regulation of the industry, such as is now common there. For agriculture in the war has assumed the character of a military necessity in those countries, and although not brought directly under military control, it is dominated to a large degree by its requirements and subjected to civil orders and regulations hardly less mandatory.

The increasing extent to which these measures have been put into effect in Europe, especially in the past year, shows by comparison the relative freedom which prevails here, and the absence of many of the real handicaps and hardships which have to be met in other countries. Here dependence is placed on individual response and the determination to resist failure, while there regulation and compulsion have been resorted to in a thousand ways new to modern times, and stimulation and direct aid have become the order of the day. A knowledge of the conditions and measures relating to agriculture in the war is of no small interest in this country, since food production has become one of the great cooperative enterprises between us and our Allies.

The efforts made in respect to European agriculture are well illustrated in Great Britain, since that country has been peculiarly dependent on outside food supplies. This has amounted in the past to four-fifths of its consumption of wheat and two-thirds of its foodstuffs as a whole. It has resulted in increasing the cost of the war, complicated the problem of foreign exchange, and made heavy demands on the tonnage of the merchant marine when its services were greatly needed otherwise.

This dependence on outside supplies was due in part to the amount of land in permanent grass, which under prevailing conditions was steadily increasing. As Mr. A. D. Hall has pointed out, during the forty years from 1872 to 1913 three and one-half million acres in England and Wales passed from cultivation into grass land, and the number of men employed in agriculture steadily declined with the area of plowed land.

Ordinarily the farmers of England and Wales plow about eight million acres a year. The area of temporary and permanent grass in the country amounts to 18,500,000 acres. Dr. E. J. Russell, director of the Rothamsted Station, has given some interesting illustrations of what this means to food production. For example, land in potatoes produces nearly forty times as much food as medium grass

land, while wheat land produces about eighteen times as much. An acre of these crops yield fifteen hundredweight of flour or six tons of potatoes, as compared with one hundredweight of meat from an acre of grass. The Board of Agriculture has shown that the grass lands of the country were feeding about twenty persons per hundred acres, whereas the same area of cultivated land feeds about eighty-four persons. Moreover, as the president of the board has pointed out, special emphasis was laid in the nineteenth century on the production of quality, while the present situation emphasizes quantity. "This grave situation therefore insists that we should recast the rules of good husbandry as understood by ourselves and practiced by our forefathers."

In the early stages of the war the main reliance was placed on appeals to voluntary action and the organization of machinery for stimulating greater production of staple foods. A proposal in 1915 to provide a guaranty for wheat as a means of inspiring the confidence of farmers was rejected by the government. Such a fixing of prices came later, and the past year especially has witnessed a great change in the attitude toward agriculture. It has come nearer to developing the foundation of an agricultural policy than anything that has gone before, and has shown the possibility of quickly effecting changes of most sweeping character.

Naturally, this has entailed a great many disturbances of long established customs and systems in agriculture and resulted in interference in individual action to a degree heretofore unheard of. The long list of orders, regulations, and prohibitions would have been regarded as very highhanded and autocratic a short time ago, and on the other hand things are now being done for the farmer which had not been dreamed of before. For the British farmer has not been accustomed to the various forms of governmental aid and assistance so prevalent in this country.

At the outset of the war the farmer's labor and his horses, as well as certain of his products, were largely claimed by the army. This placed him under great disadvantage in even maintaining his usual production. As early as 1915 the army requirement for hay approximated one-fourth of the entire annual production. Farmers were required to make returns as to the stocks on hand and to offer their supplies to avoid having them requisitioned. In 1916 and again in 1917, the Army Council took possession of all hay and of oat and wheat straw, to be held subject to its disposal.

Restrictions were placed by the food controller on the extent to which cereals might be used, including ultimately the prohibition of their use except for purposes of food and seed. License was required for buying or selling these products, and restrictions were

placed on the feeding of grains, especially wheat and barley, to live stock and poultry, if suitable for human consumption.

Potatoes were made the subject of numerous orders, growers being required to report monthly as to the estimated quantity in their possession, prices fixed, and a comprehensive scheme worked out for the distribution of seed potatoes. To safeguard the supply of the latter an order was issued forbidding their use for any other purpose and requiring certificates for transfer.

The cultivation of flax having become a military necessity, and the area in flax in Russia and Holland having been substantially reduced, with no dependence to be placed on getting seed from those countries, the Army Council issued an order requiring Irish farmers to save seed of the 1917 crop from at least one-eighth of an acre. Here the experiments of the Irish Department of Agriculture came into immediate use, and enabled the issuing of explicit instructions to farmers for securing the seed. Bounties were offered for flax cultivation which it is estimated will amount to upwards of a million pounds sterling. The government took possession of the 1917 crop for aeronautical supplies, and will take over the crop of 1918.

The government took possession of the hop crop of 1917, made the buying and selling of hops subject to permit by the food controller, and required growers to reduce the area of picking to one-half that of 1914 for the duration of the war.

In some sections of England bulb growers were required to take up one quarter of their area and substitute wheat, and also to plant wheat or oats between the rows on another twenty-five per cent of the land left in bulbs.

The British press has called attention to the difficulty of the farmers in feeding their live stock. Fodders and feed of all kinds have increased enormously in price, and sufficient supplies are hard to purchase. The government has taken possession of all oleagenous seeds, nuts, and kernels, including by-products like oil cakes, meal, and residues from such materials; the use of grains is very restricted, and there has been talk of priority orders giving milch cows the preference in the matter of feeds. Last year horse rationing orders were issued limiting the amounts and kinds of feed to be fed, especially to animals not used for agricultural purposes.

With the object of retaining an adequate supply of horses on the land the sale of horses used or capable of being used for cultivation of the land was forbidden except on a permit which takes account of their need on holdings. An order relative to the maintenance of live stock, issued in 1915, forbade the slaughter of animals in calf or in pig, and of calves under six months old except on license. The food controller has been empowered to requisition milk in localities where the supply is insufficient for local consumption and is being diverted;

and at the close of 1917 the use of cream was restricted to butter making and such other purposes as the food controller might authorize. All creameries, condenseries, and other milk factories were prohibited from acquiring or receiving any greater quantity of milk than was coming to them in 1916.

The entire wool clip of 1916 and 1917 was taken over by the government, prices fixed, and holders prohibited from selling to other purchasers.

The regulations have gone so far as to forbid the feeding of game on products suited to human and live stock feeding, and to encourage the killing of certain game and migratory birds by extending the open season, the reduction of the stock of pheasants, and the destruction of rabbits, hares, rooks, sparrows, and rats.

An order relative to the drainage of lands, requiring ditches, drains, and outlets to be kept open, was later extended to give the Board of Agriculture power to regulate the flow of water in rivers and streams to prevent floods and provide for the draining of adjoining lands.

These are only a portion of the regulations prescribed, but they indicate something of their scope and wide variety. They are constantly being added to as necessity is found to require, and, as the agricultural press has pointed out, "practically every product of the farm is now controlled in some way or another by one or more of these many orders."

Unusual and far-reaching as some of these provisions are, they are not more radical than the steps taken for the encouragement and assistance of agriculture. Recently various measures have been adopted to relieve the farm labor situation, for while women had volunteered for farm work in large numbers and had proved a "powerful auxiliary," and town labor and children had been pressed into service, these can not be expected to fully replace men in farm work.

Arrangements were made for temporary release of farm laborers in the army, for delayed calling, and finally to practically stop recruiting from that class. Two years ago several thousand men were assigned to farm work and as many more from the home defense forces, and during the past year some fifty thousand men have been segregated from the army and the untrained ones given training for short periods at schools throughout England and Wales. The employment of prisoners of war has not been generally popular with English farmers, but they have been used by the government in large drainage and other enterprises.

At various times provision has been made for the temporary employment of army horses and mules with drivers, by farmers in the vicinity of the camps; and ultimately the Board of Agriculture arranged for the purchase through the army of some thirty thousand

horses for farmers' use, to be distributed through the county agricultural committees. A so-called "horse officer" is provided in each county to organize the scheme. The horses are hired out to the farmers at fixed rates, on the latter's agreement to increase the acreage of cereals. Traveling gangs of plowmen also do plowing, harrowing, cultivating, etc., for small farmers at fixed rates.

The tractor has sprung into prominence as a means of "speeding up" production, and has been supplied by the government in increasing numbers. Some six hundred tractors of various kinds were apportioned among the county agricultural committees in the spring of 1917, to help farmers prepare and cultivate their land, and proved so satisfactory that the Board of Agriculture purchased several thousand for the 1918 season. The operators are in part assigned from the army or have been exempted for this service, and women have been utilized for the purpose to a considerable extent. For some time the board has maintained schools for tractor operators, both male and female.

But the provision of farm machinery does not stop with the tractor. The government has procured a great number of farm implements and machines, ranging all the way from disks and drills, cultivators and harrows, to reapers and binders. These are rented out to farmers under proper supervision. The Board of Agriculture also arranged with the Threshing Machine Owners' Association to form gangs of women to work with their outfits.

Indeed, women are employed everywhere in farm work, and the Women's Land Army, recruited by the woman's branch of the Food Production Department, has become a very large and broadly recognized factor in production. The president of the Board of Agriculture has lately stated that "every able-bodied country woman is being pressed into the urgent service of food production,"—this in a country where in normal times women play practically no part in the national food production, as they do on the continent.

The difficulty of securing fertilizers and seeds has been greatly relieved by the government, which has established prices, put into effect unusually drastic laws for inspection, and furnished enormous quantities of both classes of supplies. Although England is the greatest seed broking center of the world, English merchants selling home-grown seed to foreign countries with a foreign certificate as to quality, there has hitherto been no official control of seeds in England and Wales. A seed-testing order was issued by the Board of Agriculture during the year, and an official seed-testing station was established under it.

Feed control has also been instituted during the past year, and recently a compound fertilizer order was issued by the Minister of Munitions, which provides for the first time for a guarantee of com-

position and unit values. No one may purchase potash except on license procured of the Ministry of Munitions.

The shortage of gasoline for a time threatened to seriously handicap the operating of farm machinery, but in the summer of 1917 arrangements were made to insure every consideration to farmers and others engaged in food production—even at a time when coal gas had largely taken the place of gasoline in the operation of motor buses and private cars, the supply of the gas being carried in large bags on top of the car or in a trailer.

Last year the Board of Agriculture arranged for a scheme of credit for farmers, which has lately been simplified in procedure and enlarged so as to apply to a great variety of supplies. Credit is extended by the local executive committees, through the applicant's banker, purchases of supplies being made by the farmer in the usual way and settled for by his bank, which submits the receipted invoice to the committee.

The fixing of prices of farm crops and supplies has covered an increasingly wide range of products. This was first undertaken as a means of stimulating production of certain crops, notably cereals and potatoes, by insuring minimum prices, but has been extended to other products to protect the farmer and the public, and as a part of the machinery of food control. In addition to the products mentioned, maximum prices have been fixed for most feeding stuffs, including feeding cakes, meals, and offals, representing an appreciable reduction over prevailing prices, and the Minister of Munitions last fall fixed maximum prices for fertilizers. Dairy products, including milk, butter, and cheese, have also been the subject of price regulation.

The government has also made arrangement for the manufacture of binder twine in England, to be sold to farmers at a fixed retail price for the season of 1918. It has determined upon and put into effect a minimum wage for farm labor, partly as a measure to hold people on the land. While this minimum wage of twenty-five shillings a week will seem low to us in this country, it illustrates the difference in standards, for it insures more favorable conditions than farm workers had enjoyed.

The most radical and fundamental measure affecting British agriculture is an order relative to the cultivation of land, issued early in 1917. This makes the Board of Agriculture responsible for the proper and effective use of the land for agricultural purposes, and confers upon it very broad and autocratic powers.

Under this order the board is authorized to take possession of any land not being so cultivated as to afford the largest practicable food

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production and carry it on to that end, to require occupiers to change their plan of operations regardless of contracts, and to direct the breaking up of grass land for the growth of cultivated crops. It may also take over commons and waste lands, including sporting grounds, tennis courts, bowling greens, etc., and allot these lands to persons who will cultivate them. It practically gives the board control of agricultural land irrespective of its ownership, to be used in its discretion for the benefit of the Empire. Failure to comply with directions as to the cultivation or breaking up of land constitutes a serious offense against the Defense of the Realm Regulations.

The details of administration of the order are in the hands of the county executive committees, appointed by the war agricultural committees of the county councils, working under direction of the board. These committees have made surveys of both the cultivated and uncultivated land of their counties, issued directions for its proper utilization, and provided for inspection to insure compliance.

This measure is so extraordinary and far-reaching, and warrants such interference with established customs that it has naturally been the subject of considerable controversy and called for the exercise of unusual judgment and tact in its execution. In discussing the matter in a letter to the county committees, the president of the Board of Agriculture said: "Compulsion is no less distasteful to the Board of Agriculture than it is to farmers; yet it may in certain circumstances become a necessity. . . . In all cases the exercise of compulsory powers should always be the last resort, but in some it also remains the final resort."

In June the Prime Minister announced the official program for breaking up three million acres of grass land for the harvest of 1918. This was later reduced somewhat by taking account of the substitution of wheat for other crops. The final amount was prorated among the counties, and the executive committees were instructed to exercise discretion in selecting the poorer quality of grass land for breaking. The voluntary compliance of owners was urged, failing which notices were served which were mandatory.

Apparently there have been relatively few cases of refusal to comply with the new order, but where there have been convictions have followed. No indemnity has been provided farmers against loss from change in their system except the assurance of minimum prices. The reasonableness of the measure seems to have been generally accepted. One of the leading farm journals predicts that the right to interfere in cases of bad farming will hardly be restricted to a war measure, "but will certainly be used with considerable effect after the war is over."

As a result of the new order, together with the various regulatory and stimulative measures, the president of the Board of Agriculture

reported that of all the belligerent nations (except the United States), the United Kingdom alone in the third year of the war produced more grain than in 1916, in spite of the overwhelming difficulties under which the farmers labored. It was also announced as certain at the close of last year that a greater area of wheat had been sown in England than in any season during the past twenty years.

Still greater efforts are being made for the current year, for "we can no longer expect to obtain from abroad the quantities of bread and meat by which we have been accustomed to sustain life at home. If we do not feed ourselves no other country can or will. To what extent we shall be short of food depends on the extent of our success or failure in increasing our home-grown supplies." Evidently determination is nowhere more pronounced than in relation to agriculture. Its prosecution has become a war measure of highest importance, and the country is straining every nerve and resource to meet the necessity as now clearly seen.

These high purposes and splendid efforts command admiration. The determination to rise above the handicaps and difficulties which surround the industry furnishes an evidence of what may be accomplished under cooperation and effective leadership. Time-honored customs and long-established systems have been swept aside, in a country proverbially conservative and among a class slow to make radical change.

The British farmer has had to meet harsh criticism and charges from sources unreasoning and uninformed as to the real situation and its difficulties. These have been an added burden, but the British Premier, himself born on the land, has urged the farmer to think only of one thing—his country's need, and has confidently predicted that this will enable him to win a great triumph for British agriculture and for the Empire.

Such an example ought to prove an inspiration to us in this country, where the aims are similar and the obstacles less pronounced. We have reached the stage for adjustment in many matters and the necessity for a larger measure of cooperation in realizing the desired result. The employment of every resource is necessary. To help in this accomplishment is the opportunity of the colleges, the stations, and the vast army of agricultural extension throughout the land.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The origin and distribution of urea in nature.—Application of new methods for the determination of urea based on the use of xanthydrol, R. Fosse (*Ann. Inst. Pasteur, 30 (1916), Nos. 10, pp. 525–592, figs. 13; 11, pp. 642–676, fig. 1; 12, pp. 739–755*).—The material reported is divided into a brief introduction and five parts, as follows:

I. *The qualitative and quantitative gravimetric analysis of urea by means of xanthydrol* (pp. 531–592).—The reactions and the procedures are described and discussed in detail.

II. *Proteins and urea* (pp. 642–660).—Experimental data on the production of urea by the action of potassium permanganate and alkalis on various proteins are submitted and the theory of the reactions discussed.

III. *Synthesis of urea by oxidation of ammonia and carbohydrates or glycerin.—The probable participation of carbohydrates and fats in the phenomenon of ureogenesis* (pp. 660–672).—Data submitted show that urea is abundantly formed when glucose, levulose, sucrose, dextrin, inulin, or even cellulose is oxidized in the presence of ammonia. Glycerin and formaldehyde gave similar urea production.

IV. *Demonstration of the presence of urea in the invertebrates* (pp. 673–676).—Urea was identified by the xanthydrol method in cœlenterates, echinoderms, worms, crustaceans, insects, and mollusks.

V. *Urea in plants* (pp. 739–755).—The presence of urea was demonstrated in many of the common vegetables and food plants, such as spinach, carrots, turnips, potatoes, cauliflower, melons, and pumpkins. It is indicated that the property to synthesize urea is possessed not alone by higher plants, but also by molds. Urea was also found in germinating grains and in inactive seeds. During germination an accumulation of urea was observed in the embryo, while it occurred in only very small amounts or was practically absent in the cotyledons. Since the presence of urea has been demonstrated in plants, it is indicated that both urea and urease must be present in the material simultaneously. The function of the urease is deemed to be that of transforming into ammonia and rendering assimilable the urea contained in the plant.

Comparative analyses of fibrin from different animals, R. A. Gortner and A. J. Wuertz (*Jour. Amer. Chem. Soc., 39 (1917), No. 10, pp. 2239–2242*).—The authors, at the Minnesota Experiment Station, prepared fibrin from the blood of cattle (two samples), sheep, and swine, and determined the nitrogen distribution by the Van Slyke method (E. S. R., 26, p. 22).

The analytical results obtained showed no differences between the various samples significantly greater than the usual experimental errors. From the results it appears that "fibrin from any of these sources can be used interchangeably in experimental work without invalidating the results. Whether or not this is true for fibrins from other sources remains still an open question."

The data are reported in tabular form.

The relative influence of microorganisms and plant enzyms on corn silage fermentation, A. R. Lamb (*Iowa Sta. Research Bul. 40 (1917), pp. 313–332, figs. 13*).—This material has been noted from another source (E. S. R., 36, p. 802).

Note on orange pip oil, Dorothy G. Hewer (*Analyst, 42 (1917), No. 497, pp. 271–273*).—The author has examined a sample of orange seeds obtained as a by-product in the production of marmalade. The seeds consisted, in parts by weight, of kernel 69 and shell 31 per cent, and yielded on extraction with petroleum ether 37.5 per cent of a golden yellow oil equivalent to 54.95 per cent of the weight of the kernels. The oil was almost odorless and when freshly extracted had only a slightly bitter flavor. The bitterness, however, increased considerably and rapidly on keeping.

The following constants were obtained: Saponification value, 193.7; unsaponifiable matter, 0.14 per cent; iodin value, 100.3; refraction at 40° C., 57.5; free fatty acids, as oleic, 0.3 per cent; specific gravity at 15°, 0.9208; titer test, 34°; neutralization value, 200.1.

It is indicated that since the oil is easily saponified it should prove suitable for soap and glycerol manufacture.

Some factors influencing the quantitative determination of nitric nitrogen in the soil, J. E. Greaves and C. T. Hirst (*Soil Sci., 4 (1917), No. 3, pp. 179–205, figs. 2*).—In the course of investigations the authors, at the Utah Experiment Station, found that clear soil extracts could be obtained by adding 2 gm. of lime, ferric sulphate, ferric alum, sodium alum, or potassium alum to the soil-water mixture, by filtering through the Chamberland-Pasteur filter, or by centrifugalization.

The use of alum, the Pasteur filter, or centrifugalization yielded a clear solution with a minimum loss of nitric nitrogen. The use of calcium oxid yielded a clear supernatant solution, but the quantity of nitric nitrogen obtained from such a solution was low. This is conceded not to be entirely due to the mechanical removal of the nitric nitrogen with the precipitated colloid, for similar results were obtained when calcium oxid was added to a clear sodium nitrate solution. The ratio of soil to water was found not to have any great influence on the quantity of nitric nitrogen obtained, since the same amount was obtained from the soil when the ratio varied from as low as 1:5 to as high as 1:25. No increase in nitrogen was obtained by shaking more than five minutes, provided the soil was well pulverized and thoroughly agitated.

Chlorids, sulphates, or carbonates of sodium, potassium, calcium, magnesium, manganese, and iron were indicated as not interfering with the Ulsch reduction method (E. S. R., 3, p. 654). The presence of urea or glycocoll, however, yielded high results unless the solution was evaporated to dryness before reduction. No loss of nitric nitrogen was observed when such a solution was evaporated to dryness. "When dried blood is mixed with a nitrate less than 100 per cent of the nitric nitrogen is recovered by this method. There can be but little doubt that this is due to the reacting of nitrate with the proteins of the blood. If the resulting compound is insoluble it will settle from the supernatant liquid and thus be lost, while, if soluble, subsequent reduction will fail to liberate the nitric nitrogen; hence we would find the same error entering with any of the other methods."

The aluminum reduction method, as modified by Burgess (E. S. R., 31, p. 206), permits of an appreciable loss of nitric nitrogen. This is obviated, however, by the use of the iron reduction method, which is outlined as follows:

One hundred gm. of finely ground soil, together with 500 cc. of distilled water, are placed in quart Mason jars and agitated for five minutes, preferably in a shaker. The solution is then clarified by either the addition of 2 gm. of alum

with the soil, filtering through the Chamberland-Pasteur filter, or by centrifugalization. When alum is used no other antiseptic is necessary, but unless the analysis is to be completed at once 0.5 cc. of chloroform should be added to each sample.

An aliquot part (100 cc.) of the supernatant liquid is evaporated with 2 cc. of a saturated solution of sodium hydroxid to about one-fourth its original volume, and if urea is present, to dryness. The neck of the reduction flask is fitted with a two-hole stopper through which passes a 50-cc. separatory funnel and a bent tube which dips into a vessel containing water to prevent mechanical loss. The residue is transferred to the reduction flask with 50 cc. of ammonia-free water and 5 gm. of "iron-by-hydrogen" and 30 cc. of sulphuric acid (specific gravity 1.35) then added. The acid should be slowly added and allowed to stand until the rapid evolution of hydrogen is over and then heated to boiling for 10 minutes. The contents of the side vessel should be returned to the reduction flask before the reaction is complete to insure the complete reduction of any nitrates which may have been carried over with the first violent evolution of hydrogen. When the reduction is completed the contents of the flask are transferred to a Kjeldahl flask, neutralized with sodium hydroxid, and distilled into standard acid. The excess of acid is titrated back with standard alkali, and lacmoid used as the indicator. Proper checks should be made on all reagents, including the alum used as a flocculent.

A bibliography of 58 references to the literature cited is appended.

Note on the Blacher method for the determination of hardness in water, A. D. Behrman (*Philippine Jour. Sci., Sect. A, 11 (1916), No. 6, pp. 291–293*).—The author briefly notes the results obtained in a study of the effect of free carbon dioxid, removal of carbon dioxid, effect of sodium chlorid, and the effect of dilution of very hard water on the determination of hardness by the Blacher method (E. S. R., 31, p. 502).

A modified procedure for the determination of hardness in water based on the data obtained in the above study is outlined.

A rapid volumetric method for the approximate estimation of chlorin in milk, B. W. Hammer and D. E. Bailey (*Iowa Sta. Research Bul. 41 (1917), pp. 337–348*).—The relation of high chlorin content to abnormal flavors and odors of milk and the literature pertaining thereto are briefly discussed.

In the study reported data were obtained by direct titration of the chlorin in milk with silver nitrate, using potassium chromate as indicator, and by determining the chlorin in the ash by the Volhard method. Consistently higher results were obtained on 49 samples of milk by the direct titration method than by the ashing method. Examination of the differences between the results obtained by the two methods indicates that the direct titration of milk with standard silver nitrate gives a satisfactory comparative index of the chlorin content of the sample. By subtracting 0.025 per cent from the results obtained in the direct titration procedure, results approximating those secured by the ashing method are obtained. The direct titration procedure outlined is as follows:

A 5-cc. sample of milk is placed in a porcelain dish with 50 cc. of distilled water and 1 cc. of a 10 per cent potassium chromate solution. The standard silver nitrate solution is added with stirring until there is a distinct change in color. The solution used was made so that 1 cc. equaled 0.01 per cent chlorin and contained 2.4722 gm. of silver nitrate per liter.

The chlorin content of the samples examined by the ashing method varied from 0.0504 to 0.194 per cent and averaged 0.0968 per cent. In an attempt to determine whether the phosphates, the fat, or the casein were responsible for

the high results obtained by the direct titration procedure, the casein was found to be apparently responsible to the largest extent.

The analytical data are submitted in tabular form.

The influence of raffinose of beet molasses on the exact polarization before and after inversion by acid or invertase, H. Pellet (*Bul. Assoc. Chim. Sucr. et Distill.*, *35* (*1916*), *No. 4–6, pp. 112–117*).—Data are submitted which show the effect of raffinose on the determination of sucrose in beet molasses by inversion.

An increased polarization was observed whether the inversion was brought about by means of acid or invertase. In the determination of sucrose in beet molasses the quantity of raffinose present must be deducted from the result obtained by direct polarization to obtain the exact amount of sucrose present.

Some tabular data showing the difference in polarization in the presence of varying amounts of raffinose are submitted.

Pentose content of beet molasses, H. Pellet (*Bul. Assoc. Chim. Sucr. et Distill.*, *35* (*1916*), *No. 4–6, pp. 117–121*).—This is a general discussion, together with the description of a procedure for determining pentoses in beet molasses.

Methods for approximating the relative toxicity of cottonseed products, F. E. Carruth (*Jour. Biol. Chem.*, *32* (*1917*), *No. 1, pp. 87–90*).—The author, at the North Carolina Experiment Station, notes that on cooking cotton seed with moist heat, as is done in the hot pressing processes preparatory to expressing the oil, the glands containing gossypol are disintegrated and the substance is spread over the surface of the seed tissue and apparently undergoes a change which is assumed to be a partial oxidation. The change takes place very quickly under suitable conditions, so that some meals which have been cooked only 20 to 30 minutes are not markedly toxic for rats. The changed gossypol is no longer soluble in ether and oil, possibly because it is in some way chemically combined with some constituent of the meal, probably the protein. Its presence can be demonstrated, however, in ether-extracted cottonseed meal by treating with hot alcoholic potash. The supernatant liquid contains the substance, which, like gossypol, soon oxidizes with the production of a beautiful blue color. This substance is much less toxic than the original gossypol. The author has termed this less toxic and soluble form "D" gossypol.

For determining the presence of the highly toxic gossypol the following test is outlined: A very small amount of the meal is sprinkled on a glass slide and touched with a drop of concentrated sulphuric acid and the material observed immediately through the low power of the microscope. The presence of the toxic unchanged gossypol is indicated by numerous red areas which appear where the acid touches the more or less ruptured cells. Thoroughly cooked meals and cottonseed flour are indicated as showing very few and very small red areas. A relatively large number of red areas are, however, observed in meals cooked with insufficient moisture or for too short a time.

For the quantitative determination of gossypol present in cottonseed meal, anilin has been found to be a suitable precipitant of the material from an ether extract. In the procedure 200 gm. or more of cottonseed meal is extracted for two to three hours with ether, so as to yield from 5 to 10 gm. of oil. The meal may be percolated or shaken with ether in a flask. The extract is evaporated to a small volume, filtered, and anilin (about 10 per cent of the weight of the extract) added, and the mixture warmed on the water bath, set aside, and allowed to stand for some time. If gossypol is present, a yellow microcrystalline precipitate of the anilin compound results. This substance appears to be the dianilin salt and is indicated as having the formula $C_{30}H_{28}O_9.2C_6H_5NH_2$. In case a sufficient amount of the precipitate is obtained it may be filtered through a tared Gooch crucible, washed with a mixture of ether and petroleum

ether (1:2), and then washed with petroleum ether alone and dried at 100° C. The weight of the precipitate is converted to the weight of the gossypol by the use of the factor 0.74.

Tabular data comparing the sulphuric acid test for gossypol and the percentage of gossypol with the toxicity of the cottonseed product are submitted.

Single variety ciders and perries, B. T. P. Barker and O. Grove (*Jour. Bath and West and South. Counties Soc., 5. ser., 11 (1916–17), pp. 139–145; Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1916, pp. 10–15*).—Tabular data of the chemical composition and other particulars of the ciders and perries made during 1915–16 are submitted.

Home uses for muscadine grapes, C. Dearing (*U. S. Dept. Agr., Farmers' Bul. 859 (1917), pp. 23, figs. 4*).—This discusses and gives directions for making muscadine grape products, primarily for home consumption. The topics treated are sirup, unfermented grape juice, jelly, canned grapes, spiced grapes, catsup, conserves, preserves, jam, marmalade, mincemeat, and flavoring sirup.

Successful canning and preserving, Ola Powell, edited by B. R. Andrews (*Philadelphia and London: J. B. Lippincott Co., 1917, pp. XIX+371, pls. 4, figs. 164*).—This volume discusses the subject under the following chapter headings: History of the development of scientific canning; bacteriology as applied to canning; preparation and equipment; canning in tin; canning in glass; processing—hot-water bath; processing at high temperature; fruit juices; fruits for canning; vegetables for canning; preserves; marmalades, jams, and conserves; jelly making; pickling; drying fruits, vegetables, and herbs; preservation of meats; use of fruits and vegetables in the diet; canning club organization; the business side of canning; and teaching canning and related activities. Each chapter is followed by a number of questions which bring out the important points of the subject matter treated in the chapter and also a bibliography. An appendix is included containing the address of the various State institutions from which agricultural extension work is directed and also lists of firms furnishing supplies for canning and preserving.

Removal of stains from clothing and other textiles, H. L. Lang and Anna H. Whittelsey (*U. S. Dept. Agr., Farmers' Bul. 861 (1917), pp. 35, figs. 3*).—The general principles of stain removal are given, as well as specific methods for removing a large number of individual stains.

METEOROLOGY.

The sun and the weather, C. G. Abbot (*Sci. Mo., 5 (1917), No. 4, pp. 400–410*).—This is a plea for more systematic, widespread, and accurate daily solar constant measurements in the most cloudless regions of the earth like those now being made by the Smithsonian Institution at Mount Wilson, Cal., and Hump Mountain, N. C. It is stated that since the outstanding unexplained departures from mean daily temperatures, as illustrated in this paper, for Leavenworth, Paris, and Sydney "are seldom of much greater magnitude than the changes which are found by Clayton to be produced by changes in the sun, and as the maximum effects of solar changes follow from one to five days after the cause, depending on the latitude of the station, it may be possible that a very large proportion of weather changes will become predictable for some time in advance, if daily measurements of the solar emission shall be secured."

Sunspots, climatic factors, and plant activities, J. A. Harris (*Amer. Nat., 51 (1917), No. 612, pp. 761–764*).—Reviewing various observations on this subject, the author reaches the conclusion that "the relationship between the number of sunspots and the annual record of terrestrial meteorological phe-

nomena is very slender indeed." The correlations for rainfall and barometric pressure are especially low. "The correlation between number of sunspots and terrestrial temperature is the most consistent and substantial of the three. The coefficients average about —0.14."

It is thought that there is very little hope that the biologist will be able to correlate plant activities with sunspot numbers "unless light intensity be the means of solar influence."

The alleged influence of gunfire on rainfall, H. DESLANDRES (*Compt. Rend. Acad. Sci.* [*Paris*], *165* (*1917*), *No. 9, pp. 304, 305; abs. in Rev. Sci.* [*Paris*], *55* (*1917*), *No. 17, p. 541; Nature* [*London*], *100* (*1917*), *No. 2503, pp. 131, 132*).—The author is of the opinion that while gunfire may not be a primary cause of rainfall, it may intensify the rainfall when conditions are otherwise favorable by increasing ionization of the atmosphere (E. S. R., 37, p. 418). A statement by Saint-Saëns bearing on the matter is quoted.

Gunfire and rainfall, G. BARBÉ (*Rev. Gén. Sci.*, *28* (*1917*), *No. 21, pp. 607–610*).—Various contributions to this subject are briefly reviewed and the conclusion is reached that the evidence regarding relationship is inconclusive. In any case the matter is considered of less practical importance than many other unsettled questions relating to rainfall.

Studying the science of evaporation (*Sci. Amer.*, *117* (*1917*), *No. 17, pp. 315, 317, figs. 2*).—A brief reference is made to the establishment by the U. S. Weather Bureau of a number of small evaporation plants at various stations in the country, where it is proposed to keep detailed records of evaporation in much the same way as in case of temperature and rainfall.

"For its new work the Weather Bureau has devised a standard type of plant, which can be manufactured at low cost and which will insure uniform observations in all parts of the country. The main part of the equipment consists of a galvanized iron tank, 4 ft. in diameter and 10 in. deep. In order to provide an unruffled water surface when the measurements are taken, a metal tube, or well, is kept standing in the tank. Of course it is open at both ends, so that water rises to the same height in the tube as it does in the tank, but naturally it is not affected by the wind. It is an easy matter to reach down in this tube with a measuring rod and get the depth of water. By taking readings at regular intervals the amount which has evaporated can be determined. Of course, in case of rain, proper deductions must be made, and for that reason a rain gauge forms part of the equipment. A wind gauge, or anemometer, is mounted at one side of the tank, and maximum and minimum thermometers are also provided in an inclosed shelter."

On evaporation from a circular water surface, NESTA THOMAS and A. FERGUSON (*Phil. Mag. and Jour. Sci.*, *6. ser.*, *34* (*1917*), *No. 202, pp. 308–321*).—This article deals with certain elements of uncertainty in the calculation of the rate of evaporation from circular water surfaces, reviews work already done on the subject, and describes some experiments which were made on the evaporation from circular water surfaces under "everyday conditions." The subject is treated from the purely physical side.

Soot-fall studies in St. Louis, E. L. OHLE and L. MCMASTER (*Wash. Univ.* [*St. Louis*] *Studies*, *5* (*1917*), *I, No. 1, pp. 3–8, pls. 5*).—The soot fall was collected at 12 different places in the city during one year by means of cans 10 in. high and 4 in. in diameter, placed on buildings at least two stories high and which were not sheltered between taller buildings. The amount of soot so collected varied from 506 to 905 tons and averaged 812 tons per square mile per year, the total soot fall for the city being 49,870 tons.

California earthquakes during 1916, A. H. PALMER (*Bul. Seismol. Soc. Amer.*, *7* (*1917*), *No. 1, pp. 1–17, pl. 1*).

Ohio weather for 1916, W. H. Alexander and C. A. Patton (*Ohio Sta. Bul. 314 (1917), pp. 617–697, figs. 63*).—Tables showing temperature and rainfall for the entire State in comparison with similar data recorded at the station are supplemented by a series of diagrammatic maps showing the comparative weather conditions for the various sections of the State.

The mean temperature for the year at Wooster was 48.9° F.; for the State, 51°. The highest temperature at the station was 99°, August 21; for the State, 104°, August 21. The lowest temperature at the station was —7°, February 22; for the State, —18°, February 14. The annual rainfall at the station was 34.93 in.; for the State, 37.24. The number of rainy days at the station was 141; for the State, 119. The prevailing direction of the wind was southwest at the station and in the State at large.

Weather notes, 1916, E. Oliver (*Saskatchewan Dept. Agr., Ann. Rpt. Sec. Statis., 10 (1917), pp. 26–45*).—Brief notes are given on the characteristic features of the weather for each month of the year and data for rainfall at different places in Saskatchewan are tabulated.

The weather of the past agricultural year, F. J. Brodie (*Jour. Roy. Agr. Soc. England, 77 (1916), pp. 120–129*).—Data on temperature, rainfall, and sunshine during 1916 and preceding years are given for the British Isles, and the characteristic features of the weather during the different seasons of 1916 are discussed with particular reference to their effect on crop production.

The weather of Scotland in 1916, A. Watt (*Trans. Highland and Agr. Soc. Scot., 5. ser., 29 (1917), pp. 274–286*).—This report consists as usual of (1) a general description of the weather over the Scottish area from month to month and (2) a selection of rainfall returns, in which each county in Scotland is represented by one or more stations. Outstanding features of the weather of 1916 were the prolonged spell of wintry weather in February and March which put a stop to agricultural operations, the cold spell in June, and a general deficiency of sunshine.

SOILS—FERTILIZERS.

Studies on the Paleozoic soils of North Wales, G. W. Robinson (*Jour. Agr. Sci. [England], 8 (1917), No. 3, pp. 338–384, figs. 2*).—This is a report of studies of the general characteristics of the soils of the counties of Anglesey, Carnarvon, and Denbigh, in North Wales, in which the main soil types are described, including soils derived from the weathering of local glacial drift, and the associated sandy, alluvial, and peaty soils.

With the exception of sands, alluvia, and peats, the soils of the area are of loam texture, and clay soils are rare. "The clay fraction rarely exceeds 10 per cent in the case of soils derived from the shale, or 7 per cent in the case of the Anglesey and Carnarvonshire loams. Usually the clay fraction falls considerably below these figures. The silt fractions, on the other hand, particularly in the Paleozoic silt loam, form a considerable proportion of the soil." Sedentary soils and soils derived directly from local drift deposits contained remarkably high proportions of fine gravel. This was particularly the case in the subsoils. One sedentary soil in Carnarvonshire contained over 40 per cent of fine gravel in the subsoil.

Analyses of a number of the fractions obtained in mechanical analysis showed that these soils were poorer in silica and richer in alumina and ferric oxid than English soils. "The most notable difference, however, is that in the Welsh soils the most siliceous fraction is never the fine gravel as in the Craibstone and English soils. . . . The highest percentage of silica is found in the coarse sand in four cases, in the fine sand in three cases, and in the silt in three cases."

These soils were also generally deficient in calcium carbonate, and contained relatively large amounts of organic matter and potash. The phosphoric-acid content was relatively high in the silt loams and low in the sands.

The influence of soil conditions on the decomposition of organic matter in the soil, E. J. Russell and A. Appleyard (*Jour. Agr. Sci. [England], 8 (1917), No. 3, pp. 385–417, figs. 9*).—Studies conducted at the Rothamsted Experiment Station on the changes in bacterial numbers, nitrate content of the soil, and carbon dioxid content of the soil air are reported, these having been determined at frequent and regular intervals during several seasons on five different plats of land. The results are graphically presented.

"There is sufficient resemblance between the curves for bacterial numbers, carbon dioxid (except for a period on cropped land), and nitrate to justify the conclusion that they are all related. The curve for nitrate, however, is always behind that for bacterial numbers, the lag amounting to two or three weeks. Assuming . . . that the curves are connected, this would indicate two stages in nitrate production, one related to the bacterial numbers, the other not. . . .

"The biochemical decompositions in the soil are determined in the first instance by the temperature and do not proceed to any notable extent below 5° C. As soon as the temperature rises action begins rapidly; but it soon slows down and other factors begin to operate. Moisture is one of these. Action came to a minimum in June, when the moisture fell to 10 per cent by weight of the unmanured soil and 15 per cent by weight of the dunged soil, or 16 and 22 parts, respectively, by volume, assuming there was no contraction. Rainfall is an even more important factor, a shower of rain having a notable effect in starting the decompositions. It seems probable that the dissolved oxygen is an important factor here. The growing crop exerts a depressing effect, though whether by taking up the dissolved oxygen, by giving out carbon dioxid, or by some other action, is not clear. The fluctuations in bacterial numbers are not wholly explicable as functions of the temperature and moisture content."

Changes in the physical composition caused by the conversion of dry soil into paddy soil, W. H. Harrison (*Madras Agr. Dept. Yearbook, 1917, pp. 73–76*).—Experiments are reported and the conclusions drawn that "wet methods of cultivation when first applied to dry soils tend, in the first instance, to bring about a redistribution of the soil particles between the soil and subsoil. The tendency is for the coarse particles to accumulate in the subsoil and the finer particles in the soil. Afterwards the main tendency is to cause a rapid breaking down or weathering of the particles both in the soil and subsoil, thus causing the soils to become heavier in character."

Forms of occurrence of phosphoric acid in soil, M. A. Jegorov (*I͡uzh. Russ. Selsk. Khoz. Gaz., 1916, Nos. 13–14, pp. 4, 5; 15, pp. 4, 5; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 9, pp. 1248, 1249; Jour. Soc. Chem. Indus., 36 (1917), No. 5, p. 298*).—Experiments with podzol soil containing 0.0532 per cent phosphoric acid and two chernozem soils containing 0.145 and 0.11 per cent phosphoric acid are reported, in which the organically combined phosphorus was separated and estimated by washing the soil with 3 per cent hydrochloric acid and treating with 3 per cent ammonia solution, the resulting solution being then filtered and precipitated with lead acetate.

"The washed precipitate, freed from lead with hydrogen sulphid, was redissolved in dilute ammonia, the liquid filtered, concentrated, and finally extracted with ether, the organic phosphorus going into solution. . . . Of the total phosphoric acid in these soils, the ammonia solution removed about one-half in the first and third, and one-third in the second. The organic phosphoric acid extracted varied from 10 to 17.67 per cent of the total phosphoric acid.

Its nature varied with the source, but it is apparently related to the nucleinic acids. The 3 per cent hydrochloric acid extract contained the element in both inorganic and organic forms and during its evaporation a considerable amount of the latter was converted into the former."

The phosphate depletion of the soils of Bihar: Its effect on the quality and yield of crops and the contingent risks of malnutrition and endemic disease in cattle and man, W. A. Davis (*Agr. Jour. India, Indian Sci. Cong. No., 1917, pp. 77–89*).—Evidence is given of a deficiency of phosphorus in Bihar soils, and the relation of this deficiency to malnutrition of cattle, low milk yield, and nervous diseases of horses is discussed.

[Experiments on alkali soil], D. Hansen (*U. S. Dept. Agr., Bur. Plant Indus., Work Huntley Expt. Farm, 1916, pp. 24, 25*).—The results of attempts to reduce the excessive amount of salts in a tract of land on the Huntley reclamation project and to grow crops on the soil are briefly described. The land was seriously affected by seepage due to a rapid rise of the ground water under this area in 1914 and 1915. As a result the amount of alkali salts has increased in the first 4 ft. of soil since 1913. The construction of a drain in 1915 relieved the condition, the ground water being lowered to a depth below 5 ft.

Alfalfa planted for seed on the soil in 1916 yielded a small amount of hay but practically no seed. Sweet clover made a heavy growth and yielded seed at the rate of 4.53 bu. per acre in 1916. From results secured in 1915 and 1916 "it appears to be one of the best crops for this heavy land, both as a seed crop and for hay and pasture."

The importance of mold action in soils, P. E. Brown (*Science, n. ser., 46 (1917), No. 1182, pp. 171–175*).—This paper calls attention briefly to the varied action of molds in soils, and presents a compilation of various published data and some of the unpublished results of experiments on the subject conducted at the Iowa Experiment Station with the idea of emphasizing the need of further study of these organisms.

It is thought that fungi occur actively in soils and that their action must be important regardless of their relative numbers compared with bacteria. "It seems evident that mold action in soils may be of far greater significance than has previously been supposed in preparing available food for plant growth. . . . If soil bacteriology is to be developed to the proper extent in the future and the relation of microorganisms to soil fertility is to be established with any degree of certainty, investigations must include not only bacterial action, but the activities of molds and possibly also the growth of protozoa and algæ."

Carbon dioxid production in soils and carbon and nitrogen changes in soils variously treated, R. S. Potter and R. S. Snyder (*Iowa Sta. Research Bul. 39 (1916), pp. 253–309, pl. 1, figs. 21*).—Following a review of the literature, experiments are reported in which it was found that calcium carbonate in the course of 124 days increased both the total amount of carbon dioxid evolved from soil and the amount given off by the organic matter in the soil. The same was true for the soils receiving applications of 10, 20, 30, and 50 tons of manure per acre. Less calcium carbonate was decomposed from the soils receiving manure than from the unmanured. The greater the application of manure the less was the decomposition of the carbonate. The ammonia evolved from the soil under the conditions of the experiment was negligible.

"It is believed that the conditions of this experiment approximate field conditions closely enough to venture the statement that under normal conditions there is no danger of the loss of nitrogen from the field by volatilization of ammonia. There was quite an accumulation of nitrates in the manured soils. Magnesium carbonate caused a somewhat greater accumulation of nitrates than

did calcium carbonate. The addition of large amounts of manure to the soil caused an increase in the total nitrogen after a period of about four months. It is suggested that this accumulation of nitrogen was caused by increased azofication due to easily available energy material added with the manure."

The nitrification of pyridin, quinolin, guanidin carbonate, etc., in soils, M. J. FUNCHESS (*Alabama Col. Sta. Bul. 196* (*1917*), *pp. 65–82*).—Continuing work previously noted (E. S. R., 36, p. 212), experiments are reported on the nitrification of pyridin, quinolin, guanidin, carbonate, etc., in acid soils and acid sandy loams and to determine the effect of lime thereon.

It was found that "with the exception of naphthylamin, each of the compounds used was nitrified in soil. At the concentration used, naphthylamin inhibited nitrification in both limed and unlimed soil. Quinolin was nitrified most readily in soil having the highest lime requirement. Lime retarded or even inhibited nitrification of quinolin. Lime practically inhibited nitrification of guanidin carbonate. Nitrification of dried blood, piperidin, nucleic acid, alloxan, and asparagin was greatly increased by lime.

"Heavy applications of certain nitrogenous compounds may retard nitrification. Liming a soil which had been partially sterilized with carbon disulphid greatly increased its power of nitrification. A still further increase was obtained by reinoculation of the soil after partial sterilization.

"Vanillin proved to be nontoxic toward nitrification of piperidin, moderately toxic toward nitrification of dried blood and pyridin, and inhibitory toward nitrification of quinolin. Lime counteracted the toxicity of vanillin to a very large degree.

"The effect of coumarin on nitrification was quite variable. In some instances it exerted an inhibitory effect; in others none. In most cases where coumarin exerted an inhibitory effect, lime greatly reduced the amount of inhibition.

"Pyrogallol retarded nitrification of all compounds except quinolin and piperidin in one soil. Lime reduced the injurious effect of pyrogallol in all cases except in the quinolin-treated soil.

"Salicylic aldehyde completely inhibited nitrification of all compounds except piperidin in one soil.

"Carbon black apparently overcomes a part of the bad effect of certain nonnitrogenous compounds on the process of nitrification."

The maintenance of soil fertility, C. E. THORNE (*Agr. of Mass., 1916, pt. 2, pp. 33–48; Mass. Bd. Agr. Circ. 65* (*1917*), *pp. 15*).—General principles for the maintenance of soil fertility are outlined as the results of experience at the Ohio Experiment Station.

Fertilizers as an aid to profitable farming, G. C. ARNOTT (*London: McGlashan, Gregory & Co.* [*1917*], *pp. 73*).—This is essentially a war-time publication apparently designed to give practical information as to the most efficient utilization of the available supplies of natural and artificial fertilizers for different crops under English conditions. Part I deals with plant food elements, their function and effects, and Part II deals with the value of experiments as indicating the profit resulting from the judicious use of suitable fertilizers.

Fertilizing California soils for the 1918 crop, C. B. LIPMAN (*California Sta. Circ. 170* (*1917*), *pp. 8*).—This circular contains information and suggestions regarding proper systems of fertilization to be followed on California soils to meet war-time conditions. It is pointed out that the arid soils of California are particularly deficient in nitrogen and organic matter.

"In the soils of the San Joaquin Valley and in those of the southern valleys of California, including the southern coast valleys, the southern portion of the

Sacramento Valley, and in other places where the rainfall is below 16 in. per annum, it appears that a high-grade inorganic nitrogenous fertilizer is to be preferred to the organic forms and especially where quick results are desired. The best representative of the high-grade nitrogenous fertilizers for the class of soils under consideration here is sulphate of ammonia. It may be used on all crops in the case of these soils. Nitrate of soda may be used also in the case of grain soils with good effect. . . . On soils of the northern and northwestern counties of the State, including a considerable portion of the north half of the Sacramento Valley and in some of our more southern coast valleys, together with a few more isolated and limited districts all over the State, in which the soils contain more than the usual quantity of organic matter and of nitrogen, the high-grade organic nitrogenous fertilizers will serve as well. . . .

"In general phosphate fertilizers can not at the present time be made to yield profitable returns on the arid soils of California." This is attributed to the relatively great depth of the soil and the consequently larger plant-feeding area.

"With the possible exception of the delta soils . . . it seems quite certain that potash fertilizers can not be made to return profitable yields on arid California soils. In addition, it also seems true that the size of the crop may not be materially increased by the use of potash fertilizers, even without profit."

Fertilizer experiments (*Minnesota Sta., Rpt. Grand Rapids Substa., 1916, pp. 24–45, figs. 11*).—Fertilizer experiments on both upland and muskeg with field and truck crops are reported.

No marked improvement in crop yields has so far been shown from any fertilizer except barnyard manure on upland soil. On muskeg, liming showed marked beneficial results on practically all crops, grains, grasses, and vegetables. The effect of lime on the stand of grasses, legumes, and weeds was striking. The fertilizer treatments on muskeg have not been run long enough to give conclusive results. A test of vegetables on muskeg showed more marked beneficial results from fertilizer treatment on deep peat than on shallow peat. This was especially true in the use of lime.

The value of activated sludge as a fertilizer, W. D. Hatfield and E. Bartow (*Univ. Ill. Bul., 14 (1916), No. 5, pp. 336–347, figs. 4*).—This is an abstract of a thesis containing a summary of different experiments on the subject, showing that the nitrogen in activated sludge is in a very available form and that activated sludge is valuable as a fertilizer. Calculations based on comparison with dried blood show that activated sludge should be worth about $20 a ton.

See also a previous note by the authors on this subject (E. S. R., 34, p. 520).

Experiments in the bacterization of peat for soil fertilizing purposes, D. H. Jones (*Abs. Bact., 1 (1917), No. 1, pp. 43, 44*).—In an endeavor to substantiate Bottomley's claims regarding the preparation and value of bacterized peat as a soil fertilizer, some experiments were conducted on the bacterial and chemical treatment of peat, following the method practiced by Bottomley.

A sample of peat was divided into five 1-bu. lots. Lime in varying quantities was added to three of these and then they, and one of the remainder, were inoculated with rich broth cultures of soil bacteria, the fifth lot being kept as control. All were incubated at 25° C. for one month, being moistened and mixed up occasionally to aerate. All samples were then autoclaved at 15 lbs. for one hour. Rich cultures of Azotobacter, *Pseudomonas radicicola*, and cellulose fermenting bacteria were then added to all except the control and incubated at 25° for two months.

Different lots of the peat were mixed in the percentages of 0.5, 2, and 10, with a sample of poor soil, and filled into 7-in. flower pots, and in these radish seed

was sown. After one month's growth a marked difference in size and greenness of foliage in favor of the bacterized peat (10 per cent application) was noticed. After three months' growth the final examination showed as a rule greater development both of foliage and roots for the bacterized peat samples than for the control, the heavy application of peat (10 per cent) giving more than 100 per cent increase of plant by weight. The addition of lime to the peat did not appear to have much, if any, beneficial effect.

It would appear from the above that the bacterial treatment to which this sample of peat was subjected was beneficial in making the peat useful as a fertilizer. But as heavy applications, i. e., 10 per cent by weight of soil, were necessary to give marked beneficial results, the expense of preparation may preclude its general application to the soil as a fertilizer.

Study of the nitrification of different leathers available for agricultural use, and of sulphureted rape cakes, GUILLIN (*Compt. Rend. Acad. Agr. France, 2 (1916), No. 27, pp. 760–769; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 9, pp. 1253–1256; Jour. Soc. Chem. Indus., 36 (1917), No. 5, p. 299*).—Nitrification experiments are reported with clayey lime soil which was treated with dried blood, tanned leather, chrome leather, roasted leather, leather waste treated with sulphuric acid, leather waste treated with sulphuric acid and liquefied, and sulphureted rape cake, containing, respectively, 11.72, 8.15, 8.87, 6.77, 6.63, 7.36, and 5.62 per cent of nitrogen. These materials were added in amounts equivalent to 1 gm. of nitrogen per kilogram of soil, and nitrate determinations were made at intervals of one, two, and five months. The following table shows the amounts by weight of nitrates found after one and three months:

Nitrification experiments.

Nitrogenous material.	Weights of nitrates found.	
	After 1 month.	After 3 months.
	Grams.	*Grams.*
Blood	1.080	2.433
Tanned leather	.166	.404
Chrome leather	.003	.227
Roasted leather	.220	.523
Dissolved leather (pasty)	.742	1.547
Dissolved leather (liquid)	.990	2.015
Rape cake	.888	2.291

"The effects of chrome leather and of dissolved leather upon the growth of young wheat plants were investigated in pot experiments. Ten weeks after germination the crops were weighed, and taking the weight of the control plants as 100, that treated with chrome leather was 30, and that with dissolved leather 115. Chrome leather is, therefore, injurious to vegetation. Neither tanned leather nor roasted leather are suitable soil amendments. Under very favorable conditions of nitrification, the former gave 0.021 and 0.078 gm. of nitric acid after one and five months, respectively, and the latter 0.075 and 0.197 gm. per gram of fertilizer nitrogen applied. Leather which has been thoroughly decomposed with sulphuric acid is a useful fertilizer."

Action of ammonium salts on the growth of barley, H. G. SÖDERBAUM (*K. Landtbr. Akad. Handl. och Tidskr., 55 (1916), No. 1–2, pp. 57–66, figs. 2; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 7 (1916),*

No. 9, pp. 1275–1278).—Experiments with barley on sandy loam soil fertilized with potash and different phosphates, and to which were added sodium nitrate, ammonium chlorid, and ammonium sulphate separately in amounts corresponding to 134 lbs. of nitrogen per acre, are reported.

It was found that both where superphosphate and bone meal were used, the ammonium salts produced results inferior to those produced by nitrate. On the whole, better results were obtained with ammonium chlorid than with ammonium sulphate. Where bone meal and ammonium salts were used the addition of magnesium carbonate increased the yield, but where bone meal was used with sodium nitrate the addition of magnesium carbonate decreased the yield. Where basic slag was used there was little difference between the results obtained with ammonium salts and sodium nitrate.

It is concluded that "the hypothesis of a progressive acidification of the substance of the plants must be dismissed, and it is more in keeping with the facts to assume that what really takes place is a poisonous action of the ammoniacal salts exerted direct on the plant. Recent experiments appear to show that the carbonates of calcium and magnesium promote the processes of nitrification by bringing about the transformation of the injurious ammoniacal salts into nitrates which are not injurious, hence their beneficial action."

Manufacture of synthetic nitrates by electric power, E. K. SCOTT (*Jour. Soc. Chem. Indus., 36* (*1917*), *No. 14, pp. 771–777, figs. 7; abs. in Sci. Abs., Sect. B—Elect. Engin., 20* (*1917*), *No. 10, p. 369*).—This is a discussion of different processes and equipments for manufacturing synthetic nitrates by electric power, and includes a comparison of these with the so-called indirect methods involving the manufacture of calcium carbide and cyanamid and the oxidation of ammonia.

Manganese as a catalyst in atmospheric nitrogen fixation by plants through bacterial agencies, A. DE G. ROCASOLANO (*Rev. R. Acad. Cien. Madrid, 14* (*1916*), *No. 10, pp. 681–693, fig. 1; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr.*, 7 (*1916*), *No. 9, pp. 1256, 1257; Jour. Soc. Chem. Indus., 36* (*1917*), *No. 5, p. 299*).—"Quantities of 100 cc. of culture bouillon of known nitrogen content and containing mannitol and varying amounts of manganese chlorid were inoculated with pure cultures of *Bacillus radicicola*, *Clostridium pasteurianum*, and *Azotobacter chroococcum*, incubated at 22–23° C. for 25 days, and after sterilization analyzed for total nitrogen by Kjeldahl's method. With the exception of *B. radicicola* the organisms did not function in the total absence of manganese, but in all cases its presence accelerated nitrogen fixation, the optimum quantity being 0.006 gm. of manganese ion per 100 cc. of bouillon. With this amount three times more nitrogen was fixed than in the control vessel. Acceleration was retarded when the manganese exceeded the optimum, and with 0.02 gm. the fixation itself was retarded.

"Under field conditions crops would be stimulated by fertilizers containing manganese in amount not exceeding 0.006 gm. per 100 gm. of soil. Most soils already contain more than this amount of manganese, but it is mostly in an unavailable form. In estimating the quantity of this catalyst to be applied, the amount already present in a soluble form must be taken into consideration."

Reversion of acid phosphate, C. C. JAMES (*Jour. Indus. and Engin. Chem., 9* (*1917*), *No. 7, p. 682*).—It was found that by the addition of 25 gm. each of calcium oxid, unground coral sand, and unground brown guano, separately, to 475 gm. of acid phosphate the reversion of the phosphate with the coral sand was 0.62 per cent in 5 days and 0.86 per cent in 20 days. With brown guano the reversion was not so great, and with lime it was 3.75 times as much.

Notes on the greensand deposits of the eastern United States, G. H. ASHLEY (*U. S. Geol. Survey Bul. 660–B* (*1917*), *pp. 27–58, pl. 1, fig. 1*).—This report deals with the greensand deposits of New Jersey, Delaware, Maryland, Virginia,

North Carolina, Tennessee, and Arkansas, with particular reference to the amount and solubility of their potash contents.

The descriptions and analyses indicate that the best greensands are in New Jersey and Delaware. The deposits in places have a maximum thickness of 20 or 30 ft., though as a rule it is less, and a horizontal extent of many miles. The quantity varies both in different parts of the section of the bed at the same place and from place to place. In the main these beds outcrop at the surface and have a cover as a rule not more than their own thickness. Locally they carry more than 7 per cent of potash, and over large areas they carry from 5 to 7 per cent of potash. Many of the deposits are close to transportation and so situated that they could be mined by dredge or steam shovel readily and cheaply. The deposits examined south of Delaware are of lower grade. It is considered probable, however, that all of those examined have a sufficient extent for commercial use, if a cheap method of obtaining the potash can be found.

With reference to the solubility of the potash "experiments were made in dissolving the potash of the greensand in a solution of carbon dioxid. An automatic agitator was used and the tests lasted several hours. The solution contained such a small amount of potash, however, as to indicate that the process was not commercially feasible. Similar experiments, with like results, were carried on with sulphur dioxid, which could be obtained as a by-product from the smelters, and dilute hydrochloric acid also failed to give results of value. . . . The results obtained do not lend hope to the successful use of such methods. . . . The advantage of greensand over feldspars lies in its abundance and possible low first cost, exclusive of freight."

An article is included on methods of analysis of greensand by W. B. Hicks and R. K. Bailey.

Manufacture of potash from feldspar (*Jour. Bd. Agr.* [*London*], *23* (*1917*), *No. 11, pp. 1087–1091*).—Tests with two British feldspars and a Swedish feldspar of the so-called Rhodin process for rendering the potash of feldspar soluble in water are reported. It was found that by this process 75 per cent of the potash content of certain feldspars can be obtained in soluble form, while the insoluble residues can be made into a white or nearly white cement, valuable for decorative purposes.

The recovery of potash as a by-product in the cement industry, W. H. Ross, A. R. Merz, and C. R. Wagner (*U. S. Dept. Agr. Bul. 572* (*1917*), *pp. 22*).—"Analysis of samples of raw mix and of cement from 113 cement mills in the United States and Canada shows that the potash in the raw mix varies from 0.2 to 1.16 per cent, and that the percentage of potash volatilized in the different plants varies from 24.5 to 95.9 per cent. From the results thus obtained it has been calculated that the potash escaping from the kilns of these plants ranges from 0.35 to 5.14 lbs. per barrel of cement produced, with an average for the plants of this country of 1.93 lbs. On the basis of an average production of 90,000,000 bbls., the total potash escaping from the cement plants of this country amounts to about 87,000 tons annually. It has been demonstrated commercially that 90 per cent of the potash escaping in the dust is recoverable, and from experiments made in this laboratory it would appear that 95 per cent of the recoverable potash is, or may readily be made, available. . . . Assuming, in the light of results that have already been obtained, that it would be practicable to increase the percentage of potash volatilized to at least 65 per cent for all plants, then the available recoverable potash would amount to more than 100,000 tons annually, or to nearly one-half of the normal consumption of potash in this country.

"If it be assumed, further, that the dust escaping from the kilns amounts on an average to 4 per cent of the raw mix fed into the kilns in the case of dry-process plants, and to 2 per cent for plants using the wet process, then, on the basis of the results already given, the total potash content of the dust escaping from the former plants will vary in different plants from 1.4 to 20 per cent, and in the latter from 9.1 to 35.1 per cent.

"The ratio of potash to soda in the dust as determined for 20 different plants varies from 0.92 to 6.07, with an average of 2.66."

The recovery of water-soluble potash as a by-product in the cement industry, W. H. Ross and A. R. Merz (*Amer. Fert., 47 (1917), No. 7, pp. 26–28*).—This article is based on the investigations noted above.

The nature of cement mill potash, R. J. Nestell and E. Anderson (*Jour. Indus. and Engin. Chem., 9 (1917), No. 7, pp. 646–651, fig. 1*).—Studies of the potash content of cement mill dust and fumes are reported. It was found that dust from cement kiln gases may be composed of mechanically carried-over raw material and solid residues from fuel combustion, together with volatilized alkalis.

"Such dust contains considerable amounts of potash present both in readily and slowly soluble form. The readily soluble potash usually occurs as sulphate, due to a combination of this base with the sulphur of the fuel and, where there is a deficiency of sulphur, partly as carbonate. The slowly soluble potash is probably of a siliceous nature, largely formed by the union of potash vapor with incandescent ash particles. This siliceous potash becomes soluble on boiling with water for a few hours, and on treatment with cold water for longer periods. The presence of lime accelerates the solution. Slowly soluble potash compounds are also formed by the interaction of potash salts in solution with siliceous material, this recombination being greatly accelerated by heat. The action of moist soil promotes the availability of the slowly soluble potash. In view of the gradual and continued solution of the potash in cement kiln dust, it should be of particular value as fertilizer material."

Recovery of potash from beet and cane molasses in the United States, J. S. Horn (*La. Planter, 59 (1917), No. 8, pp. 122, 123*).—Reviewing the subject from the practical standpoint the author concludes that the recovery of potash is very profitable in all distilleries at present, especially on large plantations where the alcohol can be used for motive power in tractors and in beet producing regions far from a potash supply. It is further thought that the process will always be profitable in the Hawaiian Islands and Australia for economic reasons.

Comparative fertilizing values of ground limestone and dolomitic limestone, H. von Feilitzen (*Svenska Mosskulturför. Tidskr., 30 (1916), No. 4, pp. 383–392, figs. 2*).—Experiments comparing pure ground limestone with dolomitic limestone containing 55.09 per cent calcium carbonate and 41.66 per cent magnesium carbonate showed that the dolomite when well pulverized can be used with good results on soil poor in lime.

Lime on the farm, F. B. Guthrie (*Dept. Agr. N. S. Wales, Farmers' Bul. 115 (1917), pp. 31*).—This is a discussion of different forms of lime and their profitable utilization in agriculture, with special reference to New South Wales conditions.

Law in relation to commercial fertilizers (*Bul. Bd. Agr. Del., 6 (1917), No. 4, pp. 3–10*).—The text of the Delaware fertilizer law is given, together with a copy of the rules and regulations to carry it into effect.

Commercial fertilizers, H. E. Curtis et al. (*Kentucky Sta. Bul. 205 (1916), pp. 397–538*).—This is the fertilizer inspection and analyses report for Kentucky for 1916.

AGRICULTURAL BOTANY.

Dictionary of plant names, H. L. Gerth van Wijk (*The Hague: Martinus Nijhoff, vol. 1, 1911, pp. XXIV+1444+V; vol. 2, 1916, pp. XXXIII+1696*).—Volume 1 of this dictionary, which is published by the Dutch Society of Sciences at Haarlem, gives the English, French, German, and Dutch names of plants, the arrangement being according to the scientific names of the plants.

The second volume is an index of alphabetically arranged common names with their scientific equivalents. Native and local names are also freely given.

Notes on new or rare species of Ravenelia, W. H. Long (*Bot. Gaz., 64 (1917), No. 1, pp. 57–69*).—To the new species of Ravenelia which he has previously recorded (E. S. R., 36, p. 145) the author now adds *R. hoffmanseggiæ*, *R. siderocarpi*, and *R. prosopidis*. He also discusses *R. rœmerianæ*, *R. mesillana*, *R. siliqœ*, *R. australis*, *R. gracilis*, and *R. leucœnæ*.

Plants, seeds, and currents in the West Indies and Azores, H. B. Guppy (*London: Williams and Norgate, 1917, pp. XII+531, pls. 4*).—The observations reported as carried out in association with the author's work on seeds and fruits which has been noted previously (E. S. R., 27, p. 729), extended over a period of about eight years. He has also drawn freely for illustrative data upon the contributions of others, lists of which are furnished. An extended study was made of the stranded seed and fruit drift of the West Indian region and of that on European shores as a means of approach to the problems of plant distribution. The similarity between the African and the West Indian littoral floras is explained in connection with what is known of ocean currents in this region. He holds, as a most important teaching from his study, that living plants afford testimony which is often as insistent as is that of the rocks as to past changes in the arrangement of land and water.

Observations on a new type of artificial osmotic cell, J. Rosett (*Plant World, 20 (1917), No. 2, pp. 37–57, figs. 3*).—The author describes a modification of Traube's cell for the illustration and study of osmotic phenomena. This modification is said to be adaptable and convenient.

Into a mixture of the solutions of sodium silicate and sodium salicylate a crystal of potassium permanganate is dropped. The quick formation and rupture of the sac which develops around the crystal is followed by the formation of a protuberance which becomes elongated into a stem, the structure, behavior, and management of which are discussed.

The osmotic concentration of the tissue fluids of Jamaican montane rain forest vegetation, J. A. Harris and J. V. Lawrence (*Amer. Jour. Bot., 4 (1917), No. 5, pp. 268–298*).—This paper, the second of a series dealing with problems of osmotic concentrations in plant tissue fluids (E. S. R., 33, p. 628), presents determinations of the freezing point lowering of extracted leaf sap of plants from the Blue Mountains of Jamaica, discusses the differences noted in connection with local differences in the environmental complex, and briefly compares the series as a whole with others now available.

The results of the present study (though showing less marked contrasts) are said to confirm the conclusions drawn from investigations of the deserts of southern Arizona as regards the existence of a higher osmotic pressure in the tissue fluids from the leaves of ligneous plants than in those from herbaceous plants. The four subhabitats recognized in the Blue Mountains show distinct differences in the concentration of their tissue fluids. The ruinate, regarded as the most xerophytic of the habitats, shows a distinctly higher concentration of leaf tissue fluids than does any other habitat. The ridge forest, the leeward ravines, the windward ravines and slopes, and the windward habitats form a descending series as regards sap concentration.

The osmotic concentration of the sap of plants in the Blue Mountains is the lowest yet extensively investigated, the ligneous forms averaging about 11.44 atmospheres and the herbaceous plants averaging about 8.8 atmospheres. These figures are compared with those from other series in other regions. These averages, though the simplest expression of regional differences, are admitted to be not adequately descriptive, as they conceal differences which obtain in each of the areas investigated. Further comparisons are to be presented later.

The relationship between the osmotic concentration of leaf sap and height of leaf insertion in trees, J. A. Harris, R. A. Gortner, and J. V. Lawrence (*Bul. Torrey Bot. Club, 44 (1917), No. 6, pp. 267–286, figs. 4*).—The authors present data obtained from a study of the relationship between the height of insertion of leaves and the physicochemical properties of the leaf sap in trees growing in the open or in the woods.

Measurements made on 26 trees belonging to 12 species are said to show that, almost without exception, the osmotic concentration of leaf sap (determined by the freezing-point lowering method) increases from lower to higher levels, while specific electrical conductivity shows a tendency, though less regular, to decrease from below upward. Almost without exception, the ratio of specific electrical conductivity to freezing-point lowering decreases from below upward.

The observed relationship of physicochemical properties to the level of leaf insertion is thought to be due to either internal or environmental factors. The probable bearings of the observed facts are discussed.

The effect of surface films of Bordeaux mixture on the foliar transpiring power in tomato plants, J. W. Shive and W. H. Martin (*Plant World, 20 (1917), No. 3, pp. 67–86, fig. 1*).—Extending the investigations reported by Martin (E. S. R., 36, p. 454), and employing improved methods worked out by Livingston and Shreve (E. S. R., 37, p. 26), but using in this work tomato plants in full bloom which had been grown under agricultural conditions in the open field, the authors state that the indices of transpiring power of the leaves treated with Bordeaux mixture range from 18 to 29 per cent higher than do those of the untreated leaves. The maximum indices in foliar transpiring power for all occur near the middle of the day, and the influence of the Bordeaux mixture in raising the index is as pronounced when the indices are low as when they are high.

Permeability of membranes as related to their composition, F. E. Denny (*Bot. Gaz., 63 (1917), No. 6, pp. 468–485, figs. 6*).—The author describes a study of questions raised in the course of a previous investigation (E. S. R., 38, p. 25) regarding the identity and the relative importance of the substances determining the rate of passage of water through membranes. Seed coats from various economic plants were used. An account is given of factors and treatments influencing permeability.

The substances affecting the permeability of the membranes to water were lipoids, tannins, and pectic substances. Soluble proteins were not detected. Suberized layers were not significant in this connection.

Resistance of seed coats of Abutilon theophrasti to intake of water, W. E. Davis (*Bot. Gaz., 64 (1917), No. 2, pp. 166, 167*).—The results of tests with seeds of *A. theophrasti* covered with water in stoppered vials in 1910 and removed as they were found to have swollen and with seeds collected in 1916 from plants standing in the field are said to indicate a wide range in the resisting power of the coats of these seeds to water intakes. It is thought that many of the more resistant seeds lie in the soil for many years before germination can take place.

The viability of radish seeds (Raphanus sativus) as affected by high temperatures and water content, H. D. Waggoner (*Amer. Jour. Bot., 4 (1917), No. 5, pp. 299–313, fig. 1*).—A study of seeds of *R. sativus* of several varieties is said to have shown that the viability of the seeds at given temperatures is lowered by a high initial water content of the seeds, and that, at a given water content, viability is lowered by an increase of temperature. Seeds injured by high water content or high temperature suffer retardation in germination, which shows a direct relation to these readings. Radish seeds of equal initial water content show very much greater resistance to heat in dry-corked flasks than in water, and still greater in open dishes in ovens. The amount of water absorbed or given up by the seeds during treatment appears to be the chief determining factor as regards the development of resistance. Seeds heated in water lose increasingly in dry weight with rise of temperature.

The influence of light on the germination of the seed of varieties of Nicotiana tabacum, J. A. Honing (*Bul. Deli Proefstat. Medan, No. 7 (1916), pp. 1–14*).—Having noted a statement by Raciborski (E. S. R., 12, p. 1050) to the effect that tobacco seeds locally tested germinated very poorly, if at all, in darkness, and one by Gassner (E. S. R., 35, p. 222) to the effect that the seeds of *N. tabacum* belong in the group of seeds which are insensible to light, the author has tested many varieties. He has found that while seeds of Deli tobacco kept in darkness can not germinate more than a small percentage, those of some other varieties germinate in darkness as completely as in light (but require a longer time).

The results of tests with 51 samples representing widely separated regions are tabulated. In darkness the types obtained from the Balkans and Asia Minor germinated most quickly of all and gave the highest percentages. The American types gave a low rate (none above 50 per cent) of germination or none at all in darkness. Types from western and central Europe took an intermediate position, except in one case. Only the seeds of *N. quadrivalvis* agreed with the seeds of *N. tabacum* used by Gassner as regards behavior in darkness.

The growth of isolated plant embryos, G. D. Buckner and J. H. Kastle (*Jour. Biol. Chem., 29 (1917), No. 2, pp. 209–213*).—In experiments attempting to nourish the Lima bean plant with different compounds, it was found that glucose and other sugars produced growth, while starch and Hopkins' plant-food solution caused no appreciable stimulation. Cotyledons which showed no reducing sugars caused no growth, while those cotyledons with glucose added gave a good growth. Cotyledons of beans that had germinated and contained reducing sugars also supported growth in isolated embryos. It appears that growth is obtainable when glucose or a carbohydrate giving a hexose on hydrolysis is present, but not in the absence of these substances. While the dry bean does not contain the food necessary to the growth of its own embryo, the green cotyledon of a germinated bean contains the food materials necessary to normal growth.

Observations on the chondriome in tulip flowers, A. Guilliermond (*Compt. Rend. Acad. Sci. [Paris], 164 (1917), No. 10, pp. 407–409*).—The author states that he has found the tulip flower to be as well adapted to the study of chondriomes as that of *Iris germanica*, previously utilized for this purpose (E. S. R., 35, p. 333). The tulip flower has been utilized to make very precise observations, which are said to confirm those previously made regarding the elaboration of the xanthophyll pigment.

Characters and alterations in the chondriomes of the epidermal cells of the tulip flower, A. Guilliermond (*Compt. Rend. Acad. Sci. [Paris], 164 (1917),*

No. 16, pp. 609–612).—The author, briefly describing the method and results of a continuation of the study above noted, employing two varieties of *Tulipa suaveolens*, states that the mitochondria are the most delicate elements of the cell and the first to manifest cellular degeneration or injury due to osmotic exchanges. The visible alteration consists largely in the transformation of the mitochondria into relatively large vesicles which assume the aspect of vacuoles, giving to the cytoplasm what appears to be an alveolar structure.

The action of oxidase on anthocyanin, I. NAGAI (*Bot. Mag.* [*Tokyo*], *31* (*1917*), *No. 363, pp. 65–74, figs. 2*).—The author gives a preliminary report on studies in which an actively oxidizing plant juice, as that of the potato tuber or of certan mushrooms, when added to an aqueous extract of anthocyanin, discharged the color of the extract, according to tables and graphs which are given. It completed the change in about one hour in most cases, extracts from some flowers proving to be somewhat more stable. The mode of action of the plant juices appears to be analogous to that of hydrogen peroxid, which also decolorizes plant juices, the rate of discharge being proportional within limits to the concentration of the solution, this fact also furnishing a means of estimating the oxygen value of the plant juices. The decolorizing effects of the enzyms on plant juices are thought to be due to the destruction of the complex anthocyanin molecule and not to any intramolecular changes, since the action is not reversible.

The sugar content of potatoes as related to age and treatment with liquid air, H. I. WATERMAN (*Chem. Weekbl.*, *13* (*1916*), *No. 5, pp. 122–127; abs. in Jour. Chem. Soc.* [*London*], *110* (*1916*), *No. 643, I, p. 359*).—It is stated that the conversion of starch into sucrose which occurred when potatoes were dried at 40° C. did not occur if the potatoes were previously immersed in liquid air.

The effect of ringing on the transfer of materials in Cornus controversa, S. HIBINO (*Jour. Col. Sci. Imp. Univ. Tokyo*, *39* (*1917*), *Art. 5, pp. 40, pls. 13*).—In tests carried out with *C. controversa*, the author found that water conduction was interfered with very slightly by bark ringing, very seriously by bark and wood ringing, but almost not at all by ringing half way around the stem at either depth or by boring into the wood. Abnormal anthocyanin formation occurred in leaves both above and below the injury in trees that had been ringed. The leaves on the parts above the injury faded and fell earlier than those below, especially where the wood also was ringed.

In case of ringed trees vegetation was much delayed and imperfect in its development and somewhat etiolated the following spring. Blooming also was earlier and more abundant and more fruit was produced. Adventitious shoots were abundant below the ring, particularly in cases in which the wound was deep. Callus developed at the cut edges more strongly in the shallow rings. The water content of the leaves decreased after a time, more particularly in those of the lower portions, those of the deeply ringed trees soon dying completely. The twigs above the ring contained larger proportions of both organic and inorganic materials.

In the shallow ringed trees, there was excess of starch, reducing sugar, ether extract, and ash content, while in deeply ringed trees there was an excess of nonreducing sugar, protein, raw fiber, and tannic acid. In the leaves above the shallow rings, starch was in excess and diastase more so, but this excess was less in the trees that had been deeply ringed. Diastase was present in greater degree in leaves containing anthocyanin than in those which were green in case of both shallow ringed and uninjured trees, the leaves with high anthocyanin content containing an excess of reducing sugar. Leaves of ringed trees contained excess of oxidase and of peroxidase as well as of diastase. These differences were not observable in case of trees which had been only half

ringed. *Cryptomeria japonica* and *Prunus mutabilis*, which had been shallowly ringed, were attacked by insects with particular severity above but not at all below the ring.

Recent studies on sectioning and regeneration in plants, L. DANIEL (*Rev. Gén. Bot., 29 (1917), No. 339, pp. 65–72, figs. 11*).—The author has made further observations (E. S. R., 19, p. 728) on the production of anomalies by sectioning and other forms of injury to growing plants. Decapitation of *Eucalyptus globulus* was followed by the development of the more juvenile form of leaves. Carrot roots which had been sectioned or otherwise injured gave unusual forms which are described.

The cause of the disappearance of coumarin, vanillin, pyridin, and quinolin in the soil, W. J. ROBBINS (*Alabama Sta. Bul. 195 (1917), pp. 49–64, pls. 2*).—Experiments with sandy loam soils, one of neutral reaction and fair fertility and the other of decidedly acid reaction, are reported. A list of cited literature is included.

It was found that "vanillin, coumarin, pyridin, and quinolin when added separately to the soil used at a concentration of approximately 1,000 parts per million of air dry soil produce a great temporary increase in the number of bacteria which will develop on Brown's albumin agar. In the case of vanillin and quinolin it is shown that this increase in numbers is preceded by a decrease. The number of Actinomyces colonies in the soils treated with coumarin, vanillin, and quinolin decreases, reaching a minimum roughly corresponding with the maximum in bacterial numbers.

"Steam sterilizing of the soil used in these experiments produces material toxic to the growth of wheat plants. Soil microorganisms destroy the toxicity of the steamed soil under the conditions of the experiment. The effect on the growth of wheat of vanillin, coumarin, pyridin, and quinolin in sterile soil and in soil which has been sterilized, reinoculated, and incubated was compared. In the inoculated soil the toxicity of the four compounds largely disappears. It persists in the sterile soil.

"Specific bacteria were isolated from the soils used which utilize coumarin, vanillin, and pyridin as food sources. The bacterium feeding on vanillin will in pure culture destroy the toxicity of vanillin [and coumarin] to wheat. . . . The increase in the numbers of bacteria in the soils treated with the four compounds and the disappearance of the toxicity of these substances in inoculated soil is believed to be due to the fact that they serve as favorable food sources to definite species of bacteria."

FIELD CROPS.

[Work with field crops on the Huntley reclamation project experiment farm in 1916], D. HANSEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Huntley Expt. Farm, 1916, pp. 1–10, 12–14, 16–23, figs. 2*).—This continues work previously noted (E. S. R., 36, p. 132), together with additional new experiments including methods of establishing irrigated pastures, methods of seeding clover, and crop rotation experiments.

The average yields of all crops in 1916 in the irrigated-crop rotation experiments amounted to 4.64 tons of alfalfa, 11.17 tons for sugar beets, 240.3 bu. for potatoes, 78.2 bu. for oats, 26.4 bu. for wheat, 36.3 bu. for corn, and 17.7 bu. for flax. The maximum oat yield for 1916 amounted to 104.8 bu. per acre and was grown in rotation with alfalfa (2 years) and potatoes. The maximum potato yield, 401.7 bu., followed alfalfa for 3 years. The maximum sugar beet yield, amounting to 17.93 tons, was obtained in a rotation of beets (manured) and potatoes.

Sugar beets grown in rotation yielded 1.59 tons more per acre in 1916 than in 1915, the average percentage of sugar, however, amounting to 15.5 in 1916 as compared with 17.7 in 1915. Beets grown on manured oat stubble land gave an average yield of 12.52 tons per acre, while the average yield after oats without manure was 8.5 tons.

Maximum wheat yields were secured in a 2-year rotation with sugar beets. Wheat grown continuously for 5 years yielded 21.7 bu. per acre as compared with a yield of 24.8 bu. on an adjoining plat where the straw was returned each fall and plowed under.

Maximum corn yields were secured in a 2-year rotation with potatoes and the minimum yield in a 2-year rotation with oats. Flax following alfalfa pastured by hogs in 1914 and corn hogged off in 1915 yielded 27.9 bu. per acre in 1916, while flax grown continuously for 5 years produced 7.5 bu. per acre.

In experiments in establishing irrigated pasturage, three grass mixtures were employed, representing rates of seeding of 21, 17, and 16 lbs. per acre, respectively. Average acre yields were secured amounting to 35 bu. of wheat as a nurse crop cut for grain, 1.93 tons for wheat cut for hay, and 0.85, 0.22, and 0.67 ton of grass hay for mixtures 1, 2, and 3, respectively. It was concluded that good stands of grasses could be obtained with grain seeded as a nurse crop provided proper care is exercised in applying the irrigation water. It is deemed expedient to meet the water requirements of the grasses rather than those of the nurse crop for the best results. Plats seeded in the manner described above in 1915 are said to show comparatively little difference in the growth of the grasses although those seeded without a nurse crop produced slightly more growth early in the season.

Spacing tests with sugar beets were conducted in 1912, 1914, and 1916, the beets being planted in rows 18, 20, and 24 in. apart and thinned to distances of 6, 9, 12, 15, and 18 in. in the row for each row width. The highest yield for 1916 was at the rate of 15.4 tons per acre from the 24-in. rows, with beets thinned to 6 in. in the row. The lowest yield, amounting to 13.26 tons per acre, was secured from 18-in. rows thinned to 15 in. Three-year average yields for the different row widths amounted to 15.31, 15.17, and 16.03 tons per acre for 18-, 20-, and 24-inch rows, respectively. Average yields for plats thinned to 6, 9, 12, 15, and 18 in. regardless of distance between rows amounted to 15.95, 15.03, 15.77, 15.31, and 15.51 tons, respectively. A slight decrease in sugar content appeared to accompany an increase in width of row, distance of thinning, and size of beet produced.

Field tests in sugar beet root-louse control by means of irrigation, similar to more limited experiments conducted in 1915, are reported with results confirmatory of those previously noted (E. S. R., 33, p. 430).

Sugar beets siloed at harvest time showed an average loss in weight on December 1 of 4.4 per cent. Based on 1916 prices for sugar beets it is estimated that the average loss in value amounted to 28.5 cts. per ton, the sugar content remaining practically constant.

Red, white, and alsike clovers were sown on duplicate plats in the spring with wheat as a nurse crop cut for hay, with wheat cut for grain and without a nurse crop, and seeded in late summer in wheat stubble. Red clover produced a good stand with the three methods of spring seeding, while white and alsike clovers produced good stands only without a nurse crop, a stand estimated at about 50 per cent being secured with a nurse crop. All three clovers produced good stands from the late summer seedings. Red clover plats gave an average yield of 1.8 tons of hay per acre and alsike clover a yield of 0.65 ton per acre. The average yield of wheat as a nurse crop cut for grain was 40.6 bu. per acre and of wheat cut for hay 2.03 tons per acre.

Seed production rests with alfalfa including (1) clipping the alfalfa early when about 8 or 10 in. high, leaving the second growth for seed, (2) harvesting the first crop for hay and leaving the second crop for seed, and (3) leaving the first crop for seed, gave average yields amounting to 2.56, 2.39, and 3.44 bu. per acre, respectively.

Svanhals and Smyrna barleys, with yields of 45.5 bu. per acre each, were the leading barley varieties tested in 1916. Mariout was lowest with a yield of 31.1 bu.

In variety tests with corn for the 3-year period of 1914–1916, inclusive, U. S. Selection 133 was highest with an average yield of 48.9 bu. per acre and Minnesota No. 23 lowest with 36.2 bu. Northwestern Dent, with an average yield of 43.4 bu., was the highest of the early-maturing varieties and is held to be the most dependable variety tested. Six varieties tested for silage production in 1916 gave yields varying from 8.69 tons per acre for Northwestern Dent to 14.49 tons for Australian Flint. Although higher yields of silage were secured from late-maturing varieties it was regarded as of rather inferior quality.

Alfalfa grown on plats fertilized with different amounts of acid phosphate each year since 1913 gave an average yield for all plats of 1.55 tons per acre, with no significant difference in yields due to the fertilizer.

[Report of field crops work at the Grand Rapids substation, 1916] (*Minnesota Sta., Rpt. Grand Rapids Substa., 1916, pp. 10–23, figs. 7*).—This reports the progress of work previously noted (E. S. R., 37, p. 228) during 1916. Meteorological data are summarized for 1915 and 1916.

In variety tests with spring wheat for 1915 and 1916 the highest average yield, 19.9 bu. per acre, was obtained from Prelude, with Marquis second with 17.5 bu. In milling tests with 4 varieties of spring wheat, Prelude gave the highest percentage of flour, 72.7, as compared with 68.8 for Marquis, and was also deemed superior in quality to the other varieties tested.

Kherson, with a 2-year average yield of 84.1 bu. per acre, was first among the oat varieties tested; Banner second with 79.5 bu.; and White Russian third with 78.9 bu.

In variety tests with barley the maximum average yield for 1915 and 1916 was obtained from Blue Ribbon and amounted to 39.1 bu. per acre. Odessa, with 38.4, and O. A. C. No. 21, with 38 bu., were second and third, respectively.

Variety tests with winter wheat in 1916 resulted in yields ranging from 10.6 bu. for Bearded Fife to 26.8 bu. per acre for Turkey Russian. Winter injury to wheat varied from 0 for Turkey Red and Egyptian Amber to 29 per cent for Kharkov.

Wisconsin No. 2 winter rye yielded 41.4 bu. per acre with no winterkilling. Time-of-seeding tests with winter rye, with planting dates of September 1. September 15, and October 1, resulted in yields of 31.3, 26.1, and 23 bu. per acre, respectively.

Minnesota No. 13 corn, with a total yield in green weight of 12 tons per acre, was first in the 1916 variety tests and is deemed best for either silage or fodder, and under favorable conditions is said to mature seed. Minnesota No. 23 and early flint corn are recommended for ear corn or for hogging off.

Eight varieties of field peas were tested for hay and grain production in 1916. Green Canada and Wisconsin No. 508 were first in yield of forage, with 2.4 and 2.2 tons of hay per acre, respectively. Wisconsin No. 508, Green No. 208, and Green Canada, with yields of 30.5, 25.8, and 24.6 bu. per acre, respectively, gave the highest yields of seed.

Variety tests with 6 grasses and 6 clovers resulted in maximum yields of 2.5 tons of hay per acre for English bluegrass for the grasses, and of 3.8 tons for Mammoth clover for the clovers. English and Italian rye grasses, with yields

of only 0.58 and 0.75 ton per acre respectively, winterkilled, while sweet clover, sainfoin, and Bokhara clover are reported as producing poor stands and being very weedy.

Tests with different-sized seed pieces of potatoes resulted in yields per acre of 336.1 bu. for whole tubers, 272.7 bu. for half-tubers, 232.7 bu. for quarter-tubers, and 258.9 bu. for the ordinary cut, with percentages of marketable tubers amounting to 86.9, 88, 88.4, and 86.7, respectively. Fifty-three varieties of potatoes were tested, with yields varying from 8 bu. per acre for Early Market, to 426 bu. for Peach Blow. British Queen and Green Mountain, with yields of 412.4 and 411.5 bu., were second and third, respectively. Green Mountain was highest in the percentage of marketable tubers, with 95.4 per cent.

In the alfalfa experiments the average of all varieties inoculated with soil and grown without a nurse crop was 4,600 lbs. of cured hay per acre as compared with 3,133.3 lbs. with barley as a nurse crop. In another test the average yields were 5.120 and 3,520 lbs., respectively. The total average yield of all varieties tested was 5,776.4 lbs. of cured hay per acre. N. W. Experiment Station, which is thought to be a strain of Minnesota Grimm, gave the highest total yield of hay, 7,188.1 lbs. per acre, followed by Grimm with 7,104 lbs.

[Field crops], R. H. Clemens (*Rpt. Montieth Demon. Farm, 1916, pp. 8–21, figs. 10*).—Field work on the Montieth Demonstration Farm in Ontario with winter and spring wheat, barley, peas, flax, oats, clover and grass seed, alfalfa, turnips, and potatoes for 1916 is reported. Satisfactory results were obtained with feeding silage made from a mixture of oats, peas, and vetches.

[Field experiments in 1916], H. von Feilitzen (*Svenska Mosskulturför. Tidskr., 31 (1917), No. 3, pp. 246–260*).—The experiments reported were conducted by the Swedish Moor Culture Association on 20 experiment fields and 26 demonstration fields on moor soils. The results are summarized as a whole.

The use of lime, even on peaty soils in which the lime content was nearly adequate, produced good effects mainly, it is thought, through a promotion of nitrate formation. The application of increasing quantities of phosphoric acid and potash on soiling crops and grass gave varying results in different localities. At Kristineberg the best yield of green forage was secured from the use per hectare of 300 kg. of superphosphate and 250 kg. of 37 per cent potash salt. On meadows the best results were secured at Tobo with 300 kg. of Thomas slag, at Lundås with 200 kg. of superphosphate and 100 kg. of 37 per cent potash salt, and at Törne with 200 kg. each of superphosphate and 37 per cent potash salt.

Applications of nitrate of soda on a fairly good peat soil increased the yield of spring rye grown for soiling purposes, but on the best soils of this type the use of nitrate did not prove profitable. Barnyard manure in general gave good results. In one locality its residual effect the third year after application was not very apparent. The value of the manure in these tests, based on the results, was 88 öre per 100 kg. (about 10 cts. per 100 lbs.). Annual fertilization of the soil was found necessary to obtain good yields of the different moorland crops, and the addition of commercial fertilizers to barnyard manure in general gave profitable returns.

Results obtained with oats, barley, root crops, and grass are also briefly noted.

[Report of field crop work], W. J. Colebatch and R. C. Scott (*Jour. Dept. Agr. So. Aust., 20 (1916), Nos. 3, pp. 175–195; 4, pp. 256–276; 5, pp. 344–359; 20 (1917), No. 6, pp. 464–479*).—Tillage, manurial, and rotational experiments conducted on the permanent experimental fields of the Roseworthy Agricultural College since 1904 are outlined and the results through 1915 reported. Detailed tabular data are presented and discussed.

The tillage experiments included depth-of-plowing tests and a comparison of early and late fallows. The deeply-plowed (7 in.) winter fallow, adequately cultivated to keep down the weeds and check loss of moisture through evaporation, has been the most remunerative system tested.

The fertilizer experiments included tests with phosphates, commercial nitrogenous materials, potash, farmyard manure, and lime. The phosphate tests were extensive and included the testing of various phosphorus carriers and of phosphate applications under various cropping conditions. The results of all fertilizer tests are summarized in tabular form, showing the direct effects of the various treatments on wheat when harvested for grain or hay, as indicated by the net values of the mean yields. In the bare-fallow, wheat rotation an application of 2 cwt. of acid phosphate gave the highest net return with both grain and hay, the value of the mean yields being $2,67 and $2.87 per acre, respectively, in excess of the value of the mean yields produced on the untreated checks. In the bare-fallow, wheat, pasture rotation an application of 0.5 cwt. of acid phosphate gave the highest net return for wheat, $4.66, while the highest return for hay was $5.28 from an application of 1 cwt.

The rotation experiments included 2-, 3-, 4-, and 5-course rotations with wheat, sorghum, rape (for pasture), barley, peas, and alfalfa. The highest net return per acre from the various systems tested was secured from a bare-fallow, wheat, barley rotation when based on the value of the wheat crop harvested either for grain or for hay.

Harvest report [Roseworthy Agricultural College], 1916–17, W. J. Colebatch et al. (*Jour. Dept. Agr. So. Aust., 20 (1917), No. 8, pp. 623–648*).—Considerable meteorological and crop data for the season 1916–17 are reported. The crop yields totaled 165 tons of berseem clover, 103 tons of cereal silage, 375 tons of hay, 200 tons of straw, and 10,786 bu. of grain, including peas, barley, oats, rye, and wheat.

Additional data show the comparative yields of wheat varieties, hybrids, and selections grown on the college farm in 1916.

Culture experiments with varieties of root crops, P. J. Lövö (*Aarsber. Norges Landbr. Höiskoles Akervekstforsök, 27 (1915–16), pp. 10–57, figs. 4*).—The results of cooperative culture and variety tests with root crops in different parts of Norway are reported.

It was found that root crops over the entire country produced yields of forage higher than those secured from any of the crops generally grown for that purpose. In most sections the best yields of forage were secured from turnips. It was also found that the turnip crop is capable of utilizing a heavier application of fertilizers, as well as better methods of culture, than are now generally given. Of the different varieties grown Dales Hybrid showed the best keeping qualities. The relative production of foliage was higher in northern Norway than in other parts of the country.

Experiments with different kinds and mixtures of hay crops, K. Vik (*Aarsber. Norges Landbr. Höiskoles Akervekstforsök, 27 (1915–16), pp. 58–115*).—Hay crops were tested in 3- and 5-year rotations.

Among the leguminous hay crops in both rotations red clover followed by alsike clover led in production. Timothy stood first among the grasses in both rotations, but a strain of English rye grass gave nearly as good yields in the 3-year rotations and several strains of fescue grasses in the 5-year rotations. In a series of 3-year tests grass mixtures gave in every case a greater yield than was secured from the same grasses grown separately. The standard mixture, consisting of 20 per cent red clover, 10 per cent alsike clover, and 70 per cent timothy, in most instances gave the best yield.

Pastures on peat soils, H. von Feilitzen (*Om Betesvallar på Torvjord. Göteborg, Sweden: Göteborg Lithographing Co., 1917, pp. 92, figs. 59*).—The discussion presented is based largely on the results obtained on the experiment fields of the Swedish Moor Culture Association. The subjects considered include the adaptability of peat soils to pastures, the kind of peat soils best suited for the purpose, methods of establishing pastures on such soils, the maintenance of the pastures to give satisfactory results for a series of years, conditions in long and recently established pastures on mossy soils and on peat soils high in nitrogen content, and the use of pastures for the production of hay.

The 1918 grain crop, T. F. Hunt (*California Sta. Circ. 169 (1917), pp. 8*).—The author briefly discusses the advisability of employing a portion of the barley acreage in California for wheat production during the present emergency, and outlines other possible means of increasing the wheat yield as (1) increased acreage through the utilization of new land, and (2) increased production on the existing acreage through improved farming methods.

The effect of different methods of inoculation on the yield and protein content of alfalfa and sweet clover, II, A. C. Arny and R. W. Thatcher (*Jour. Amer. Soc. Agron., 9 (1917), No. 3, pp. 127–137; abs. in Physiol. Abs., 2 (1917), No. 6, p. 375*).—This paper, continuing inoculation studies (E. S. R., 33, p. 633), reports the results secured with the 1915 crop and presents the conclusions drawn and the data obtained.

Inoculation at seeding time produced a large increase in yield of dry matter per acre and in percentage of protein in the dry matter in the second season thereafter (first harvestable crop) as compared with the yield and composition of the crop from adjacent uninoculated plats. In the next season's growth (second harvestable crop) the differences are much less noticeable, and practically disappear the following year because of the rapid spread of the inoculating bacteria to the uninoculated plats. Inoculation of either alfalfa or sweet clover with soil from either alfalfa or sweet clover fields was equally efficient in producing these effects. Inoculation with soil was generally more efficient in these respects than inoculation with the commercial cultures used in the experiments. Liming at seeding time (2 tons ground limestone per acre) slightly intensified the above-mentioned effects of inoculation. Inoculation produced an increased capacity of the plants to utilize mineral soil nutrients, the increased growth resulting in the removal from the soil of very much larger amounts of potassium, phosphorus, and calcium. Inoculated plants were also enabled to elaborate a somewhat larger amount of dry matter from a given amount of mineral plant-food element.

Barley in Wyoming, T. S. Parsons (*Wyoming Sta. Bul. 115 (1917), pp. 11–35, figs. 2*).—This reports experimental work for the 5-year period 1911–1915.

Hanna and White Hull-less, the only varieties grown for 5 years, gave average yields of 41.4 and 40.3 bu. per acre, respectively. California Feed and Chevalier, with 4-year average yields of 60.9 and 58.1 bu., and Success, with a yield of 62 bu. per acre for one year, were the leading varieties reported.

At the station barley required a growing period of from 106 to 122 days. With early plowing and good seed-bed preparation it showed little difference in yield on spring or fall plowed land. Good soil preparation was deemed more advantageous than very early seeding. The 2-year average yield of all home-grown seed at the station was 54.1 bu. per acre as compared with a yield of 50.6 bu. for imported seed. Barnyard manure is reported as giving good results with barley, with a marked cumulative effect. Idaho, Utah, and Colorado winter barleys tested at the Wyoming Station winterkilled, although successful yields of winter barley have been reported from Platte County.

Approved methods of barley production are briefly outlined.

Corn planting and cultivation in Montana, A. Atkinson and M. L. Wilson (*Montana Sta. Circ. 67 (1917), pp. 107–128, figs. 29*).—The preparation of the seed bed, time and method of planting, and the cultivation of corn are discussed in some detail and types of corn planters and cultivators illustrated.

[Cotton in Brazil] (*Primeira Conferencia Algodoeira. Rio de Janeiro: Soc. Nac. Agr., 1916, pp. 18; Lavoura; Bol. Soc. Nac. Agr. [Brazil], 20 (1916), No. 7, pp. 53–81*).—This is a report of the proceedings of the First Cotton Conference of Brazil and includes a classification of the commercial types of cotton in Rio de Janeiro.

How to increase the potato crop by spraying, F. H. Chittenden and W. A. Orton (*U. S. Dept. Agr., Farmers' Bul. 868 (1917), pp. 22, figs. 23*).—This outlines approved methods of control of the Colorado potato beetle, blister beetles, flea-beetles, cutworms and caterpillars, leafhoppers, aphids, late and early blight, and other foliage diseases. Directions for preparing and applying sprays are given and spraying appliances noted. Other methods of control are also briefly described.

The effect of growing radishes on the succeeding maize crop, H. E. Annett (*Agr. Jour. India, 12 (1917), No. 1, pp. 151, 152*).—Observations of marked deterioration in the corn crop grown on that portion of a field which had produced radishes during the cold weather are briefly noted. Analyses of surface soil and subsoil as to available phosphoric acid and potash did not show sufficient differences to explain the depression.

Eight years' experiments with new varieties of oats, K. Vik (*Aarsber. Norges Landbr. Höiskoles Akervekstforsök, 27 (1915–16), pp. 115–134*).—The results of experiments in progress from 1909 to 1916, inclusive, with 29 varieties of oats, including many of the newer sorts, on 71 fields in different parts of the country are reported.

The highest average yield of grain, about 70 bu. per acre, was secured from Klokke II, a cross between Guldregn and Klokke. Stormogul, which stood first in straw production with 4,462 lbs. per acre, also ranked high in the yield of grain. Guldregn, followed closely by Tartar King, ranked first in weight per bushel, with 41.4 lbs., and last in hull content, with 23.6 per cent. A brief description of the performance of each variety is given.

Ragi, L. C. Coleman (*Mysore Agr. Calendar, 1917, pp. 42–46*).—Manurial, cultural, and seed-selection tests with ragi (*Eleusine coracana*), the staple food crop of Mysore, are briefly noted. Green manuring with sunn hemp has given larger and cheaper returns than fertilizing with cattle manure. Fall plowing or early spring plowing is deemed essential to successful production.

Sugar-cane experiments for the season 1914 to 1916, J. R. Bovell and J. P. d'Albuquerque (*Barbados Dept. Agr., Rpt. Sugar-Cane Expts., 1914–1916, pp. 80*).—Fertilizer and variety tests with sugar cane are reported in continuation of work previously noted (E. S. R., 32, p. 831).

Sulphate of ammonia again gave the highest net return of the nitrogenous fertilizers, $90.53 per acre. In the phosphate series, a net gain of $110.88 was obtained from an application of 100 lbs. of basic slag, and in the potash series, 100 lbs. of potash as sulphate was highest with $94.92. The difference between the highest and lowest yielding plats for the period was 42.2 per cent.

The testing of seedling and other canes was continued as heretofore with White Transparent as the standard variety for comparison. The average yield of this variety in the black soil district, from 19 plats, was 6,610 lbs. of muscovado sugar per acre. The highest yielding seedling variety was B. 4578, with 10,531 lbs. for one plat, representing a monetary gain of $141.55 per acre over White Transparent.

On the red soils, the average yield of White Transparent was 5,814 lbs. per acre. The seedling cane B. 6450 gave the highest yield, 8,793 lbs., representing a monetary gain over the standard of $107.53 per acre.

For the period of 1912 to 1916 White Transparent gave an average yield of 4,920 lbs. on the black soils and 5,321 lbs. per acre on the red soils. The highest yielding variety for the five-year period was Ba. 6032, with a yield of 7,728 lbs. and a monetary gain over White Transparent of $67.67 per acre. B. 6450 gave the highest average yield on the red soils, 7,791 lbs., with a monetary increase over White Transparent of $59.53 per acre. This variety also gave an increase of $35.72 over the standard variety on the black soils.

In a comparison of Ba. 6032 and B. 6450 on 34 plats, Ba. 6032 gave, as a three-year average, 1,429 lbs. of saccharose per acre more than B. 6450.

Notes on improved methods of cane cultivation, C. Clarke and N. Husain (*Dept. Land Rec. and Agr. United Prov. Agra and Oudh, Bul. 35* (*1916*), *pp. 8, figs. 3; rev. in Agr. Jour. India, 12* (*1917*), *No. 1, pp. 170–172*).—Improved and tested varieties of sugar cane are recommended for the Central Provinces and cultural practices deemed best for the region outlined.

Distribution of cane for seed, H. B. Cowgill (*Porto Rico Bd. Agr. Expt. Sta. Circ. 8* (*1917*), *Spanish Ed., pp. 3–13*).—Local and introduced varieties of sugar cane are briefly described and the advantages of the development of new varieties outlined. Regulations governing the distribution of cane for seeding purposes are noted.

Sweet clover, A. Atkinson (*Montana Sta. Circ. 62* (*1917*), *pp. 49–55*).—The production of sweet clover in Montana for hay and pasture is discussed and the handling of the crop for seed production noted.

Sweet clover grown under irrigation in 1915 yielded 2.2 tons for the white-flowered biennial, 2.67 tons for the yellow-flowered biennial, and 0.62 ton for the small yellow-flowered annual. In 1916 the first two sorts yielded 3.02 and 4.2 tons per acre, respectively, the annual sweet clover being entirely winter-killed. The white and yellow flowered biennials grown on dry land at the Judith Basin substation in 1916 yielded 1.16 and 1.32 tons of hay per acre, respectively.

Harvesting and storing sweet potatoes, J. C. C. Price (*Alabama Col. Sta. Bul. 197* (*1917*), *pp. 87–103, pls. 4, figs. 4; pop. ed., pp. 87–100, pls. 4, figs. 2*).—The results of storage tests with sweet potatoes conducted at Auburn and at other points in cooperation with growers are reported for 1914–1916, inclusive, for a comparison of the keeping qualities of potatoes stored in an especially constructed storage house and those stored in banks, pits, or trenches. Approved methods of harvesting, curing, and storing the crop are described. The curing temperatures varied from 80 to 85° F. and the storage temperatures from 50 to 60°, the extreme limits for storage being from 40 to 65°. Humidity varied from 80 to 90°. Temperature and humidity records were secured during the curing and storage period for each year of the experiment and are shown by graphs.

The Triumph, Nancy Hall, and Porto Rico, deemed the most important commercial varieties grown in the State, are reported on in the storage tests and show a loss by decay in the house of from 1.5 to 11 per cent on March 1 as compared with a similar loss of from 7.5 to 100 per cent in the banks on the same date.

A selected sample of Triumph potatoes weighing 120 lbs. was placed in storage Nov. 10, 1915, and observed for loss in weight. A loss of 5.5 lbs. was sustained the first 5 days at an average temperature of 84°, while during the next 5 days under an average temperature of 62° there was an additional loss

of only 2.22 lbs. A total loss of 29.9 lbs. was noted at the end of the experiment, Mar. 13, 1916.

It is concluded that sweet potatoes can be sufficiently cured in from 10 to 14 days and that cured potatoes stored in a dry room are far superior to potatoes stored in banks in quality, condition, and freedom from decay, and that they are to be preferred for bedding purposes.

Plans and specifications are submitted for a storage house 20 by 20 ft. with a 1,250-bu. capacity.

Field experiments with tobacco, O. de Vries (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 19 (1915), pp. 44, pl. 1*).—This is a general outline of (1) the methods employed, and (2) the investigations in progress in field experiments with tobacco in the Dutch East Indies.

Expectations from the F_1 generations of tobacco, A. d'Angremond (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 23 (1916), pp. 45–65*).—This is a general discussion of the expectations in the F_2 and F_3 generations of tobacco hybrids, based on Mendelian dominance and segregation of characters.

A new seeding device, J. T. Baumgarten (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 23 (1916), pp. 91–93, pl. 1*).—A device for seeding tobacco seed beds is briefly described and illustrated.

Fertilizing the seed beds, O. de Vries (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 4 (1913), pp. 27, pls. 2*).—Fertilizer experiments at eight centers to determine the best treatment for tobacco seed beds are reported.

The results in all but two cases indicated that an application of 100 gm. of ammonium sulphate, 100 gm. of acid phosphate, and 25 gm. of potassium sulphate per seed bed of 10 by 3 ft. gave the best results. On the poor, sandy soil of one center an application of 100 gm. of ammonium sulphate, 200 gm. of acid phosphate, and 50 gm. of potassium sulphate gave the best results, while on the wet, sandy soil of another center 100 gm. of ammonium sulphate and either 100 or 200 gm. of acid phosphate proved to be best.

[Report of fertilizer experiments with tobacco, 1910–1916], O. de Vries and E. Sidenius (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 2 (1913), pp. 82; 9 (1914), pp. 42; 15 (1915), pp. 64, pl. 1; 18 (1915), pp. 31–63; 20 (1915), pp. 33–67; 26 (1916), pp. 28*).—Fertilizer experiments conducted at numerous centers in the Dutch East Indies are reported for each year. These tests were planned primarily to study the effect of chemical fertilizers upon the relative chemical composition of the lower, middle, and upper leaves of the tobacco plant, together with the effects on yield and quality.

The highest yields have been obtained from the use of ammonium sulphate, although the senior author does not recommend its use on good soil. The estimated average increase of fertilized fields for 1910–1914 was 10 per cent.

The experiments were considerably reduced in 1915–16, but gave practically the same results as noted above. With applications of 6, 10, and 16 gm. of ammonium sulphate per plant the increases were 17.6, 15.3, and 21.4 per cent, respectively.

Green manuring tests, O. de Vries (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 20 (1915), pp. 4–19, pl. 1*).—Tests during 1913 and 1914 with *Canavalia ensiformis*, *Desmodium stipulaceum*, Mucuna, *Phaseolus lunatus*, and *P. radiatus* as green manures for tobacco are reported and briefly discussed. Agronomic data are presented in tabular form for each crop and for each year of the experiment. The first three crops named gave the best average results, based on tobacco yields.

Harvesting experiments with tobacco, 1912–13, O. de Vries (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 8 [1914], pp. 43*).—The author reports experiments with early and late harvesting, harvesting of individual

leaves (priming), stripping the leaves, and cutting the entire plant, including a study of the influence of the various practices upon the color, quality, and weight of the product.

The results indicated that early-harvested leaves were brighter in color and superior in quality, though practically the same in weight, as those harvested later. When harvesting the leaves individually considerable variation was observed, resulting in a product lacking in uniformity. Cutting the entire plant produced a browner, brighter, drier, less hygroscopic tobacco which had less tendency to mold than that harvested by stripping. The leaf weight in the former method was about 10 per cent less than in the latter, but the total weight was practically the same owing to the fact that the smaller leaves were included in the harvest. It is recommended that for general practice the crop be harvested by stripping in dry years and by cutting in wet years.

Tobacco curing tests, O. de Vries (*Proefstat. Vorstenland. Tabak* [*Dutch East Indies*], *Meded. 25* (*1916*), *pp. 80*, *pls. 3*).—Extensive tests in curing tobacco are reported and the following general conclusions drawn from the results:

During the first stage, which is designated as the time occupied in changing from green to brown, requiring from 7 to 10 days, the tobacco is very sensitive to variations in temperature. The tests varied between 26 and 30° C., a 2 to 3° difference in temperature giving an entirely different curing. The relative humidity of the air was also of importance, but might vary to a greater extent than temperature (60 to 95 per cent or higher). Ventilation had little influence on the first stages.

Rapid curing resulted in tobacco of high value, possessing bright color and excellent handling qualities, while, on the other hand, rapid curing increased the hygroscopicity of the tobacco to such an extent as to frequently result in pressure spots during subsequent fermentation which offset the good effects noted above. Gradual curing, lasting two or three days longer, had the disadvantage of favoring rotting and other undesirable conditions not met with in rapid curing.

The second phase of curing is designated as the passing from the brown stage to the dry. The quality of the tobacco was about equal with either rapid or gradual drying.

Artificial drying or drying under control conditions proved to be of the greatest value in improving the quality and color of the product.

Prefermentation in special stacks of tobacco, O. de Vries (*Proefstat. Vorstenland. Tabak* [*Dutch East Indies*], *Meded. 23* (*1916*), *pp. 69–88; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr.*, *7* (*1916*), *No. 8*, *pp. 1118*, *1119; Bol. Tec. Coltiv. Tabacchi* [*Scafati*], *15* (*1916*), *No. 3–6*, *pp. 94*, *95*).—Owing to the extreme dryness of the tobacco-growing season of 1914 in Java the tobacco harvested at that time showed traces of pressure undergone after fermentation, these traces remaining visible in the form of streaks and spots on the leaves and considerably reducing the value of the product. In an attempt to remedy this fermentation stacks were designed having an open center in which the air could circulate more freely than in the ordinary form of stack.

Provided the temperature of these stacks did not exceed 35° C. (95° F), the results were very satisfactory. In subjecting tobacco thus treated to the usual fermentation processes hardly any trace of pressure was observed. The conclusion is that a slow oxidation occurs in the preliminary stacks, destroying certain essential oils which are decomposed by the heat, which frequently reaches 54° in the ordinary stacks. The products of this decomposition are then thought to impregnate the dry cells, forming pressure spots on the leaves.

Tobacco fermentation experiments, O. DE VRIES (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 21 (1915), pp. 42, pl. 1*).—This reports experiments with piles of fermenting tobacco to determine (1) the absorption of air by the piles, (2) the heat insulation of the piles, (3) heat distribution in the piles, and (4) the overheating of tobacco in piles. The report covers the period of 1910 to 1915 and consists somewhat of a compilation of the results of other investigators supplemented by the author's own work. No definite conclusions are drawn, although rather comparable results were obtained.

An ingenious device is described and illustrated for measuring heat insulation.

Tobacco fermentation tests, N. H. COHEN and H. JENSEN (*Proefstat. Vorstenland. Tabak. [Dutch East Indies], Meded. 12 (1912), pp. 38, fig. 1*).—Studies of the phenomenon of tobacco fermentation are reported in an effort to determine the rôle of bacteria and enzyms and the chemical changes occurring in the process.

Fermentation was produced at a temperature of 60° C. (140° F.) with a relative humidity of from 80 to 90 per cent. The process is reported as being in no sense bacteriological. Unsatisfactory moisture conditions occasioned a reddish tinge in the tobacco. Together with humidity, temperature exerts an influence on color, high humidity and high temperature resulting in darker color. Mechanical pressure alone had probably no material influence upon color, although a higher percentage of light-colored leaves was observed in the smaller piles. Whether this was due to better ventilation or to decreased pressure was not clear.

Similar results are reported by Jensen in experiments conducted by him independent of those described above.

Observations on the combustion of tobacco, N. H. COHEN (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 3 (1913), pp. 29, fig. 1*).—This paper is presented in three parts, as follows: (1) Methods for determining combustion of tobacco, (2) the influence of the degree of maturity upon combustion, and (3) the influence of the potash content upon combustion.

For the purpose of comparing strains of tobacco, the author recommends the use of the formula: $Br. = \frac{G}{t\sqrt{g}}$, when Br. is the coefficient of combustion, G the weight of the ash, g the initial weight of the sample, and t the time of combustion. Considerable tabulated data are presented and discussed in illustrating the use of the formnla.

Samples representative of four degrees of maturity, (1) unripe, without any indication of maturity, (2) ripe, but with yellow tinge, (3) fully matured, and (4) overripe, were analyzed. The conclusion is reached that tobacco should be entirely ripe before harvesting.

After briefly reviewing the results of other investigators the author concludes that it is still an open question as to whether a sufficient weight of potash could be supplied by any practical system of fertilization to improve combustion materially.

Observations on the combustion of tobacco, O. DE VRIES (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 22 (1916), pp. 5–23, pl. 1; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 8, p. 1119*).—The author briefly reviews the observations of Tymstra, Cohen, and others on the combustibility of tobacco and defines the phenomenon as the time occupied in the combustion of a leaf of tobacco stretched horizontally and ignited near its central part. Observations are also reported and illustrated on the color of the ash of small "cigars" made from tobacco of the same origin and

allowed to burn themselves out, a scale of colors facilitating an estimate of the differences.

Reports of fertilizer tests with ammonium sulphate, potassium nitrate, sodium nitrate, and phosphoric acid are held to indicate that fertilizer treatments have no influence on combustibility.

Observations on the combustion of different strains of tobacco produced in Semampir and Mlessen, A. D'ANGREMOND (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 24 (1916), pp. 27–39*).—This reports observations on 133 strains of tobacco, giving the average combustibility in seconds and indicating the best strains and hybrids for these localities from the standpoint of combustion.

Comparison of varieties of turnips on 101 experiment fields from 1906 to 1915, P. KROSBY (*Aarsber. Norges. Landbr. Höiskoles Akervekstforsök, 27 (1915–16), pp. 134–142*).—The results are tabulated and summarized, showing that of the four principal varietal groups the flat-topped turnips included the largest number of valuable varieties and gave the highest average yield of dry matter in the roots, approximately 4,540 lbs. per acre. The Yellow Long varieties produced about 4,373 lbs., and the White Globe and Yellow Globe varieties approximately 3,955 and 3,855 lbs. per acre, respectively. The different groups and varieties varied in dry matter production in different sections of the country. Leaf production also varied with the group and with varieties in the group in the various localities. The performance and behavior of the varietal groups, as well as of the individual varieties, are briefly discussed.

Wheat culture, J. W. GILMORE (*California Sta. Circ. 172 (1917), pp. 8*).—Factors involved in wheat production in California are briefly reviewed, emphasizing the importance of seed-bed preparation, maintenance of organic matter in the soil, the use of good seed, the time and method of seeding and amount of seed required, fertilization, and irrigation.

The conversion of the weights of mechanical separations of corn, wheat, and other grains into percentages, E. G. BOERNER (*U. S. Dept. Agr. Bul. 574 (1917), pp. 21, figs. 2*).—Tables are given and described for the conversion of weights of mechanical separations into percentages for corn (E. S. R., 36, p. 836), wheat, and other grains.

Percentage equivalents are given for separations of wheat weighing from 0.1 to 20 gm. taken from samples weighing from 25 to 65 gm., inclusive, and covering the entire range of maximum and minimum limits of color, wheat of other classes, damaged kernels, and inseparable impurities, and for separations of corn weighing from 0.1 to 40 gm. taken from samples weighing from 240 to 260 gm., inclusive, and covering the entire range of maximum limits of corn of other colors, damage, heat damage, and foreign material and cracked corn as specified in the numerical grades of the United States standards for wheat and shelled corn. The sampling device previously described (E. S. R., 33, p. 836) is also noted.

The Colorado seed act, W. W. ROBBINS and G. E. EGGINGTON (*Colorado Sta., Seed Lab. Bul., 1 (1917), No. 1, pp. 3–15, fig. 1*).—This bulletin discusses the provisions of the Colorado seed act of 1917. The text of the act is included.

Spraying for the control of wild morning glory within the fog belt, G. P. GRAY (*California Sta. Circ. 168 (1917), pp. 7*).—This forms a preliminary report on the use of arsenical sprays as an herbicide in the control of the wild morning glory in the coast regions of California. A stock solution composed of 10 lbs. of granulated caustic soda (98 per cent), 20 lbs. of white arsenic (arsenic trioxid 99 per cent), and water to make 5 gal. is to be diluted at the rate of 1 gal. of the solution to 100 gal. of water. Damp, cloudy, or foggy weather in October is deemed the best time to spray, a luxuriant growth of

mature vines being favorable to the most complete destruction of the roots. The preparation and application of the spray is described and the possible dangers to plant and animal life to be encountered in handling arsenic, briefly noted.

It is stated that from 85 to 90 per cent of the morning glory roots on plats near the coast can be killed to a depth of 4 ft. or more by the application of a properly timed spray to mature vines, and that the vines may be destroyed and prevented from seeding by the use of a spray at any time during the year. While the enfeebled roots of sprayed plants send up new sprouts which reach the surface in from 7 to 12 months, it is thought that annual fall spraying would eventually eradicate the weed.

Farm weeds of North Carolina and methods for their control, J. L. Burgess and C. H. Waldron (*Bul. N. C. Dept. Agr., 37 (1916), No. 8, pp. 20, figs. 17*).—This is a brief discussion of the methods of eradication and control of 17 of the principal weeds found in North Carolina.

Weeds in meadows at the Leteensuo experiment station, E. F. Simola (*Finska Mosskulturför. Årsbok., 20 (1916), No. 2, pp. 92–124*).—The results of culture and fertilizer experiments with special reference to weed growth on meadows established on different types of soil are reported.

It was found that the use of the harrow and the application of potash and phosphoric acid reduced weed growth and improved the quality of the hay. Through adequate and suitable top-dressings of swampy meadows such a dense and otherwise favorable growth of grass was secured that after seven years of treatment the meadows were nearly free from weeds. Inadequate applications of fertilizers resulted in thin and weak stands of grass and a high percentage of weeds.

Annual weeds which were quite numerous on fallow almost entirely disappeared and the biennial and perennial species were reduced to a considerable extent during the first year of treatment. The reduction of the species other than annuals varied with the kind of fertilizer application given.

On a clay soil originally largely overgrown with sphagnum the degree of weediness, owing to an increasing growth of *Rumex acetosella* and species of Agrostis which crowded out the clovers, was lower during the first year of the experiments than during the fifth. Of the grasses introduced into the meadows, timothy and orchard grass proved most effective and resistant. On this type of soil the grass was mixed with weeds to a less extent than on the soils of a nonclayey character.

Applications of calcium nitrate on other than clay soils gave a larger increase in the yield of hay and a greater improvement in quality than were secured from the use of ammonium sulphate. It was observed that by the fifth year of the tests the introduced grasses had died out and had been replaced mainly by *R. acetosella* and species of Agrostis. The larger applications of calcium nitrate produced the smaller quantities of weeds and the higher yields of grass.

Good yields of grass and hay with low weed content were secured on sphagnum bog soils when proper cultivation was given and a suitable grass mixture was used. In an experiment with calcium nitrate, the check plat contained only 1.82 per cent of weeds and yet the weed percentage was smaller on the treated plats. The yields of hay for the different years ranged from 1,958 to 6,213 lbs. per acre. *Lathyrus pratensis* and *Vicia cracca* grew well on this soil without the application of calcium nitrate and proved effective in counteracting the spread of weeds.

A new weed, H. W. Andrew (*Jour. Dept. Agr. So. Aust., 20 (1917), No. 7, pp. 557, 558, fig. 1*).—The appearance of *Scorzonera laciniata* (*Podospermum laciniatum*) in South Australia is reported. The plant is briefly described.

HORTICULTURE.

Horticultural statutes of the State of California (*Sacramento, Cal.: State, 1917, pp. 141, pl. 1*).—This booklet contains the text of the various California statutes and quarantine orders relating to horticulture, corrected to August 1, 1917. A list of State and county horticultural officers is included.

[Variety tests of vegetables and fruits] (*Minnesota Sta., Rpt. Grand Rapids Substa., 1916, pp. 45–57, figs. 4*).—The relative yields are given of varieties of vegetables being tested, together with data on the condition of fruit varieties planted in the new orchard. Varieties of small fruits under observation are also listed. As a result of the vegetable tests the varieties are arranged in order based both on quality and yield.

Celery storage experiments, H. C. Thompson (*U. S. Dept. Agr. Bul. 579 (1917), pp. 26, figs. 10*).—Experiments conducted by the author during the four seasons 1912–13 to 1915–16 and here described in detail indicate that it would be advantageous to cut down the standard celery crate, which approximates 24 in. in width and length, to at least 14 in. in width, thereby reducing the amount of decay in storage and the amount of injury to celery from broken crates. Actual tests show that celery in small crates sold for a much higher price than similar celery in standard crates handled in exactly the same way.

Observations made in the cold storage houses showed a much larger proportion of decay for celery in the top tier of the crates at the end of the storage period than in the lower tiers. The variation in keeping quality of celery in the different tiers was greater where the standard crate was used than where smaller crates were used. As a general rule both air temperature and celery temperature increased with the distance above the floor of the storage house. In many instances when the thermometers registered 32° F. within 4 ft. of the floor the temperature was 35 to 36° near the ceiling. The author is of the opinion that thermometers should be placed at various heights in the storage room and in the corners as well as in the passageways. Where there is much variation in temperature in different parts of the room the air should be set in motion.

Improving Grand Rapids lettuce, S. N. Green (*Mo. Bul. Ohio Sta., 2 (1917), No. 9, pp. 308–312, figs. 3*).—The author discusses the history and characteristics of the open-headed variety of lettuce, Grand Rapids, and briefly reviews the station's work in improving the variety.

Continued selection has resulted in two improved strains, one of which, the Ohio Grand Rapids, is noteworthy for its increased weight and increased seed production as compared with commercial strains.

Some suggestions are given relative to methods of producing lettuce seed.

Fresh tomatoes and tomato conserves, S. Mondini (*Bul. Uffic. Assoc. Ort. Prof. Ital., 5 (1917), No. 10–11, pp. 154–158*).—A statistical summary of the tomato and tomato product industry in Italy, including data on the export trade from 1913 to 1916.

[Fruits and ornamentals on the Huntley reclamation project], D. Hansen (*U. S. Dept. Agr., Bur. Plant Indus., Work Huntley Expt. Farm, 1916, pp. 23, 24, fig. 1*).—Notes are given on the condition with reference to hardiness of a number of varieties of fruit trees, ornamental trees, and shrubs being tested on the project, including a list of varieties of apples and ornamentals that appeared to be suited to the conditions.

Fruit growing in the Federal District, A. Caire (*Bol. Min. Agr., Indus. e Com. [Brazil], 5 (1916), No. 3, pp. 49–69*).—Notes are given on kinds of fruit grown and those adapted for culture in the Federal District, Brazil.

Pruning apple trees, J. B. KEIL (*Mo. Bul. Ohio Sta., 2 (1917), No. 9, pp. 304–307, fig. 1*).—In the spring of 1912 following the regular pruning of the station's variety test orchard a number of trees there in the nineteenth year from planting were selected for a test of the following materials used as wound dressings: Asphaltum-linseed oil, Hoyt's tree varnish, white lead and oil, a combination of these preparations, and asphaltum varnolene. Trees were selected wherever possible with 10 wounds of an inch or more in diameter.

The general effect of all the dressings used was to retard the healing process. The freedom from disease of the untreated wounds used as checks indicated that no dressing was needed. At the end of three years many wounds of 1.25 in. or less in diameter had healed over completely. The rate of healing was greatest in wounds made on the trunk and main branches and least in wounds made by cutting off tops or ends of branches. Wounds made in the early part of the growing season tend to heal more rapidly than those made while the trees are dormant.

It is pointed out that the use of fungicidal sprays against fruit and tree diseases would tend to obviate further the need for wound dressings, except in special cases such as wounds made for the control of blight and blister cankers. If any dressing is required, white lead in linseed oil is the most durable and only slightly more expensive per tree than the other dressings used.

The handling and storage of apples in the Pacific Northwest, H. J. RAMSEY, A. W. MCKAY, E. L. MARKELL, and H. S. BIRD (*U. S. Dept. Agr. Bul. 587 (1917), pp. 31, pls. 7*).—This bulletin presents the results of extensive investigations conducted by the department during the seasons of 1911–12 to 1914–15 to determine those factors which are of greatest importance to the successful storage of the apples of the Pacific Northwest. The apples used in the work were secured from the more important apple-growing sections of Washington, Oregon, Idaho, and Montana.

In the experiments apples held in storage at 32° F. showed a wide range in the cold-storage keeping qualities of the different varieties, depending upon the decay, skin blemish, texture changes, etc., which they develop. A two weeks' delay between the picking and storage of apples often greatly reduces their life in storage through more rapid ripening and the development of scald, Jonathan spot, scab, and decay. The apples kept longer and in better condition at 32° than at 35°, the difference in favor of the former temperature increasing with the time in storage.

Immature picking resulted in severe scald and early decay of apples in storage and the storage of over-mature apples was an equally bad or worse practice. Well-colored portions of the skin seldom, if ever, develop scald. Apples from orchards badly infected with northwestern anthracnose tend to decay early in their storage life.

It is pointed out that carelessness in handling previous to storage is responsible for considerable decay of apples in storage, and that the successful cold storage of apples depends as much on the treatment they receive before storage as on the conditions and temperatures under which they are held in storage.

In connection with the work as a whole some limited data were secured on the common storage of apples. Although these data are not conclusive they indicate at least that a common storage house cooled by natural circulation only can not take the place of a cold-storage warehouse for long keeping of the fruit. The bulletin concludes with tabular data and notes on the cold-storage keeping qualities of varieties of apples grown in the Pacific Northwest.

Strawberry culture in Tennessee, Kentucky, and West Virginia, G. M. DARROW (*U. S. Dept. Agr., Farmers' Bul. 854 (1917), pp. 23, figs. 11*).—This dis-

cusses the different cultural methods used in Tennessee, Kentucky, and West Virginia, and points out those which have been demonstrated by experience to be the most efficient. The subject matter is presented under the general headings of methods of culture, extent of strawberry shipments from Tennessee and Kentucky, selection of a suitable location for growing strawberries, site for a strawberry field, preparation of the soil, fertilizers, planting, system of training, care during the first summer, mulching, renewing the plantation, harvesting, and varieties.

Increase the grape yield by spraying for insects and diseases, A. L. QUAINTANCE and C. L. SHEAR (*Nebr. Hort., 7 (1917), No. 4, pp. 4–6*).—This paper contains directions for the control of the more important insect and fungus pests of American varieties of grapes east of the Rocky Mountains.

The fertilization of citrus, W. P. KELLEY (*California Sta. Circ. 171 (1917), pp. 4*).—This circular points out the more important lessons taught by various fertilizer investigations with citrus fruits conducted in California in recent years.

All of these lines of investigation and practical experience show the special importance of nitrogenous fertilizers on the citrus soils of California. Phosphoric acid is required to some extent, but the soils are, generally speaking, well supplied with potash.

[Manurial experiments with coconuts and vanilla], P. R. DUPONT (*Ann. Rpt. Agr. and Crown Lands Seychelles, 1916, pp. 5, 6, 9*).—A manurial experiment with coconut trees started by the Seychelles Botanic Station in 1916 is here outlined and the natural yield of each plat for 1916 is given. The experiment is to be continued a number of years. Data are also given on a manurial experiment with vanilla vines that has been under way for two years.

The effect of large applications of commercial fertilizers on carnations, F. W. MUNCIE (*Thesis, Univ. Ill., 1915, pp. 23*).—The data presented in this paper have been noted from another source (E. S. R., 36, p. 445).

Transplanting trees (*Missouri Bot. Gard. Bul., 5 (1917), No. 12, pp. 167–172, pls. 3, fig. 1*).—Methods of transplanting large trees are illustrated and described.

FORESTRY.

The forests of Maryland, F. W. BESLEY (*Baltimore: Md. State Bd. Forestry, 1916, pp. 152, pls. 40*).—The results are given of a forest survey of the counties of Maryland begun in 1907, with a separate map for each county showing the character and extent of the forest areas and the approximate stand of timber.

Introductory considerations deal with the present forest conditions in the State as a whole, their value to the people, and how they may best be conserved, native forest trees, principal and special uses of the forests, wood-using industries, transportation, markets, forest planting, State forest reserves, municipal forests, etc. A summary of the production of lumber, timber, and by-products in 1914, together with the forest laws of Maryland, is also included.

Forestry investigations (*Minnesota Sta., Rpt. Grand Rapids Substa., 1916, pp. 57–60, figs. 3*).—The present condition of the forest plantation is noted and data are given showing the growth of Norway, white, Scotch, and jack pines planted in 1900 and 1901 at varying distances, alone, and in combination.

Forest progress in the Drakensberg, J. S. HENKEL (*So. African Jour. Sci., 13 (1916), No. 5, pp. 179–186, figs. 2*).—This comprises observations on forest growth in the Drakensberg, Natal, South Africa.

Statistics compiled in the office of the silviculturist, Forest Research Institute, Dehra Dun, during 1915–16, E. MARSDEN (*Indian Forest Rec., 6*

(1917), No. 2, pp. IV+66, pls. 3).—This comprises statistics relative to girth increment, volume increment, and yield of a number of Indian trees.

Report of the director of forests, N. W. Jolly (*Ann. Rpt. Dept. Pub. Lands Queensland, 1916, pp. 50–55, pls. 3*).—A progress report on the administration and management of the State forests and national parks of Queensland for the year 1916. Data relative to alterations in forest areas, timber yields, revenues, expenditures, etc., are included.

Evaporation records from the Gulf coast, Laura Gano and J. McNeill (*Bot. Gaz., 64 (1917), No. 4, pp. 318–329, figs. 4*).—In connection with field work in daily rate of evaporation in several of the typical plant associations were kept, some of them running through a period of 19 months. The recording stations are here described, and the average monthly and yearly rates of evaporation Gulf coast forest associations and their relations in succession, records of the northern Florida undertaken to determine the composition and limits of certain are presented in a series of charts and discussed.

"Black storms" and their relation to forestry, L. Kirillov (*Selsk. Khoz. i Lîesov., 252 (1916), Nov.–Dec., pp. 48–74*).—The author gives an account of soil abrasion by storms in the fertile black belt of Russia and the prevention of such abrasion by afforestation. Among the trees used for this purpose are the common pine (*Pinus sylvestris*), red cedar, white birch, blackthorn (*Prunus spinosa*), and *Juniperus sabina.*

Trees recommended for planting, J. F. Rock (*Hawaii. Forester and Agr., 14 (1917), No. 11, pp. 331–337*).—In this paper the author gives a list of trees recommended for planting in Hawaii, with reference to the conservation of water and the protection of watersheds, prevention of sand or dust drifting, and the reforestation of eroded and arid areas on slopes of mountain ranges and on plains.

Forest fire prevention in cooperation with the Federal Government, J. H. Foster and F. H. Millen (*Bul. Agr. and Mech. Col. Tex., 3. ser., 3 (1917), No. 13, pp. 12, fig. 1*).—An account of the development of forest fire prevention work in Texas, including data on the results secured in the fall of 1916 and spring of 1917.

Forest depredation and utilization, F. W. Rane (*Proc. Soc. Prom. Agr. Sci., 37 (1916), pp. 73–82*).—A discussion of forest utilization as a factor in controlling the depredations of the gipsy and brown-tail moths, based upon results secured in Massachusetts.

Natural reproduction from seed stored in the forest floor, J. V. Hofmann (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 1, pp. 1–26, pls. 8, figs. 4*).—The results are given of a five-year study of some 750,000 acres of burns and 7,780 acres of cut-over land in the Pacific Northwest conducted to determine the true source of seed of young stands of Douglas fir and western white pine that spring up on these burns and cut-over areas. Summing up the evidence as a whole the author reached the following conclusions:

"The distance to which seed trees are capable of restocking the ground is limited to from 150 to 300 ft. They can not, therefore, account for the restocking of the large burned areas. The irregular, dense stands of young growth are due to seed stored in the forest floor or in cones. This seed retains its viability through the fire and is responsible for the dense reproduction that springs up after the first fire. The even-aged stands of reproduction immediately following a fire, regardless of location of remaining seed trees, the irregular alternation of dense stands of reproduction with grass areas, and the failure of reproduction on areas burned over by a second fire before the stand reaches seeding age or by consuming all of the duff and precluding any possibility of

seed remaining after the fire, all point to the seed stored in the duff as the principal source of seed responsible for the restocking.

"The ability of the seed to retain its viability when stored in the duff or when retained in cones during fires has been further demonstrated by recovering and germinating seed from duff under forest conditions and by recovering and germinating seed from cones which pass through a crown fire."

The red spruce: Its growth and management, L. S. Murphy (*U. S. Dept. Agr. Bul. 544* (*1917*), *pp. 100, pls. 7, figs. 5*).—The chief purpose of this bulletin is to formulate definite systems of forest management for various conditions. The subject matter as a whole is based upon the author's field investigations of second growth spruce and upon the literature dealing with virgin stands, including unpublished data collected by various members of the Forest Service. The phases discussed include uses of spruce, amount and value of spruce cut and imported, present stand of spruce, value of spruce and spruce stumpage, range and distribution, forest types, second growth stands of spruce, soil and moisture requirements, light requirements, wind firmness, reproduction, form, length of life and maximum size, susceptibility to injury, growth, stands and yields, methods of cutting, brush disposal, sowing and planting, and rotation. Appended to the bulletin are volume tables, taper measurements, stand tables, and sample plat data for spruce.

Preliminary study of white spruce in Minnesota, W. H. Kenety (*Minnesota Sta. Bul. 168* (*1917*), *pp. 5–30, figs. 12*).—This bulletin presents data on the soil requirements, growth, yield, and distribution of white spruce in Minnesota, together with the approximate returns which may be expected from young stands or plantations and suggestions relative to possibilities of private investments and a rational system of taxing forest lands. The salient features of the Massachusetts forest taxation law are given.

Note on red sanders (Pterocarpus santalinus), T. A. Whitehead (*[Indian] Forest Bul. 34* (*1917*), *pp. 10, pls. 4*).—A descriptive account of the red sanders tree (*P. santalinus*) with reference to its botany, habitat, distribution, and uses. The paper is accompanied by an actual wood specimen of the tree.

Preliminary review of the properties of rubber of different grades, O. de Vries and H. J. Hellendoorn (*Arch. Rubbercult. Nederland. Indië, 1* (*1917*), *No. 4, pp. 213–233, figs. 5*).—Data are given showing the viscosity, tensile strength, rate of cure, and slope of a number of rubber samples tested at the Central Rubber Station.

On the relation between specific gravity and rubber content of latex, also with regard to the use of hydrometers, O. de Vries (*Arch. Rubbercult. Nederland. Indië, 1* (*1917*), *No. 4, pp. 242–279, figs. 3*).—A discussion of these subjects based upon investigations conducted by several experiment stations in the Netherlands Indies.

Some remarks on the properties of rubber from one group of trees, and on the influence of the tapping system, O. de Vries (*Arch. Rubbercult. Nederland. Indië, 1* (*1917*), *No. 4, pp. 280–288*).—The discussion of this paper is based upon the above-noted investigation.

Wood utilizzation directory of New York, J. Harris, N. C. Brown, and H. H. Tryon (*Syracuse Univ. [Pubs.], 17* (*1917*), *No. 5, pp. 204, pl. 1, figs. 11*).—This bulletin, which was prepared by the New York State College of Forestry in cooperation with the Forest Service of the U. S. Department of Agriculture, contains a summary of woods used and total amount of lumber consumed in each industry, tables showing the use of woods in each industry and how each species is used, and a directory of the wood-using industries in the State.

Forest products of Canada, 1916.—Lumber, lath, and shingles (*Dept. Int. Canada, Forestry Branch Bul. 62A* (*1917*), *pp. 28, figs. 3*).—Statistics are given

for 1916 showing the lumber, lath, and shingle cut by Provinces and by kinds of wood. The value was, for lumber, $58,365,349; lath, $1,743,940; and shingles, $5,962,933.

Forest products of Canada, 1916.—Poles and crossties (*Dept. Int. Canada, Forestry Branch Bul. 62C (1917), pp. 8, figs. 2*).—A statistical report on poles and crossties purchased in Canada during 1916, with comparative data for 1915.

DISEASES OF PLANTS.

A textbook of mycology and plant pathology, J. W. Harshberger (*Philadelphia: P. Blakiston's Son & Co., 1917, pp. XIII+779, figs. 271*).—This book is the outgrowth of the author's 27 years' experience as a teacher of botany, during which time he conducted graduate courses in the morphology, classification, and physiology of the fungi, and also courses in the methods used by bacteriologists and mycologists.

The arrangement of the material is that suggested by the needs of the classroom and laboratory. The principal divisions of the text are mycology, general plant pathology, special plant pathology, and laboratory exercises in the cultural study of fungi. In a series of appendixes the author gives formulas for fungicides, spray calendars, keys for the determination of the genera and species of a number of groups of fungi, and directions for the culture of mushrooms and for the collection and preservation of fleshy fungi.

Plant diseases in Canada, H. T. Güssow (*Science, n. ser., 46 (1917), No. 1189, p. 362*).—The author reports having observed in the Dominion of Canada *Dothichiza populea* on Lombardy poplar, *Colletotrichum cereale* on spring wheat, and *Leptosphæria napi* on the seed pods of turnips grown for seed.

Noteworthy Porto Rican plant diseases, F. L. Stevens (*Phytopathology, 7 (1917), No. 2, pp. 130–134*).—Notes are given on a number of plant diseases observed by the author in Porto Rico.

Diseases and injuries of plants, J. Ritzema Bos (*Meded. Rijks Hoogere Land, Tuin en Boschbouwsch.* [*Wageningen*], *11 (1917), No. 5, pp. 175–215, 244–250*).—The portions here noted include accounts of unfavorable or injurious conditions affecting economic plants, such as inorganic agencies (weather, soil, and spray injury), animal parasites (including nematodes), cryptogamic diseases, and causes of undetermined character.

Pythiacystis related to Phytophthora, J. T. Barrett (*Abs. in Phytopathology, 7 (1917), No. 2, pp. 150, 151*).—From a study of three strains of *Pythiacystis citrophthora*, the author found close similarity of the oogonia, oospores, and antheridia to those of *Phytophthora cactorum*. This marked similarity is believed to indicate a close relationship between the two genera.

Puccinia glumarum, H. B. Humphrey (*Phytopathology, 7 (1917), No. 2, pp. 142, 143*).—Evidence is presented indicating that *P. glumarum* has been present in America at least 25 years and possibly longer, and that it is not of recent introduction, as previously reported (E. S. R., 33, p. 744).

A new parasitic nema found infesting cotton and potatoes, N. A. Cobb (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 1, pp. 27–33, figs. 5*).—A new parasitic nematode which has been found infesting the tubers of the potato, the feeding roots of camphor, the rootstocks of violets, and the roots of upland cotton is here described as *Tylenchus penetrans*.

"External indications of the presence of the nema are the existence on the roots or tubers of small, abnormal-looking areas, a few millimeters across, sometimes in the form of pimples, but more often in the form of slightly sunken, discolored areas. Each of these diseased areas when fully developed contains up to about 50 specimens of *T. penetrans* in various stages of growth.

"The geographical distribution of the pest is suggested by its presence in Florida, Georgia, North Carolina, New York, and Michigan. The occurrence of this disease under such different climatic conditions and in such a diversity of hosts makes it certain that the nema causing it is another species which, like some other destructive members of its genus, can adapt itself to widely varying conditions. As yet too little is known about this parasite to accurately estimate the damage done by it.

"The occurrence of the parasite in the tubers of the potato is a peculiarly significant fact and again points to the necessity of being particularly careful to plant only perfectly healthy potatoes. The mercuric-chlorid treatment of potatoes, as for scab, decreases the vitality of the nemas."

Cereal smuts, V. ZEMAN (*Rev. Facult. Agron. y Vet. La Plata, 2. ser., 12 (1917), No. 3, pp. 330–340*).—This is a discussion of *Ustilago tritici*, *Tilletia tritici*, and *T. levis* on wheat; *U. nuda* and *U. hordei* on barley; *U. avenæ* and *U. lævis* on oats; and *U. maydis* on maize, as regards the forms and effects of attack and control measures available in Argentina.

Overwintering and distribution of cereal rusts in a subtropical climate, G. GASSNER (*Ztschr. Pflanzenkrank., 26 (1916), No. 6–7, pp. 329–374*).—In pursuance of an account previously noted (E. S. R., 36, p. 542), the author discusses overwintering of cereal rusts and the significance of host alternation in the eastern subtropical parts of South America, overwintering by the uredo form in the warmer regions, spore distribution by air movements, and rust dissemination by means of seed.

In spite of the fact that teleutospores were regularly produced, it could not be shown that this method or that of host alternation was employed as a means of overwintering by *Puccinia graminis*, *P. maydis*, *P. triticina*, or *P. coronifera*. The seed were not shown to carry over the infection regularly, nor was there any evidence of the presence of a mycoplasm. It is thought that *P. graminis* and *P. maydis* overwintering elsewhere may be brought by air currents, the uredo form of the former fungus being known to winter in southern, the second in tropical, Brazil. Evidence regarding the agency of air currents is discussed.

Frost injury to cereals, H. ZIMMERMANN (*Ztschr. Pflanzenkrank., 26 (1916), No. 6–7, pp. 321–323, pl. 1*).—The effect is described (principally on rye, also on wheat and rye grass) of freezing alternating with warmer weather during parts of March, 1915, in Mecklenburg-Schwerin and Mecklenburg-Strelitz. The plantlets were loosened, the root system was largely suppressed, the plants were stunted and weakened, and attacks by nematodes and insects were apparently increased.

A girdling of bean stems caused by Bacterium phaseoli, J. H. MUNCIE (*Science, n. ser., 46 (1917), No. 1178, pp. 88, 89*).—The author reports having found in July, 1914, a peculiar girdling of the stems and branches of field beans in several localities in Michigan. Since that time the disease has been collected in various parts of the State.

The disease appears at the nodes of stems and branches as small, water-soaked spots. These enlarge, encircling the affected parts. Later these diseased areas become amber colored and the girdling is usually completed by the time the pods are half mature. The diseased tissue is said to be so weakened that the stem breaks at the affected node. The signs of the disease may appear on the stems before there is any evidence of the bacterial blight on the pods. Inoculations into stem nodes of healthy plants with pure cultures of *B. phaseoli* have produced typical signs of the disease.

It is believed that infection results from the washing of bacteria from affected cotyledons or leaves to the axils of the leaves, but the method of entry of the organism has not yet been determined.

The susceptibility of Phaseolus vulgaris to bean rust, E. Jordi (*Ztschr. Pflanzenkrank., 26 (1916), No. 6–7, pp. 374, 375*).—This is a brief account of the considerable differences noted in the resistance offered to bean rust by certain varieties of *P. vulgaris.*

On a sudden outbreak of cotton rust in Texas, J. J. Taubenhaus (*Science, n. ser., 46 (1917), No. 1185, pp. 267–269*).—The author reports having had his attention called in June, 1917, to an outbreak of cotton rust in Texas, the cause of the disease being *Æcidium gossypii.* The distribution of the disease was studied to some extent and attempts made to find the alternate stage of the fungus on grasses, particularly species of Muhlenbergia or Sporobolus, but so far without result. Investigation is being continued in the hope that the Puccinia stage will be found, so that the host upon which the organism hibernates may be discovered, thereby preventing further spread of the rust.

Lightning injury to kale, L. R. Jones (*Phytopathology, 7 (1917), No. 2, pp. 140–142, fig. 1*).—A brief account is given of lightning injury to a field of kale at Rochester, Mich.

A physiological study of two strains of Fusarium in their causal relation to tuber rot and wilt of potato, G. K. K. Link (*Bot. Gaz., 62 (1916), No. 3, pp. 169–209, figs. 13*).—A detailed account of work previously reported (E. S. R., 35, p. 246).

The mosaic disease of potatoes, P. A. Murphy (*Agr. Gaz. Canada, 4 (1917), No. 5, pp. 345–349, figs. 2*).—Losses of varying importance due to potato mosaic are indicated for localities in eastern Canada, extending westward. The disease varies somewhat in its manifestations as described. Though the infection does not pass from one tuber to another through cut surfaces, it is perpetuated by planting tubers from diseased hills. Experimentation is still in progress.

Experiments in the control of potato leak, L. A. Hawkins (*U. S. Dept. Agr. Bul. 577 (1917), pp. 5*).—In a previous publication (E. S. R., 35, p. 751), the author described a disease of potatoes due to *Rhizopus nigricans,* or, more frequently, to *Pythium debaryanum.*

In the present paper an account is given of experiments in the control of the disease, with additional data on the causal organism and its occurrence in the delta soils of California. It has been found that the disease most frequently follows injury to tubers due to wounding at the time of digging and to breaking off the knobs.

Avoidance of wounds and sorting out and shipping or storing separately the wounded tubers are recommended as preventive measures.

Losses of potato growers, E. J. Wortley (*Rpt. Bd. Agr. Bermuda, 1914–15, pp. 24–27*).—An inheritable potato leaf roll of obscure but probably nonparasitic causation is said to correspond somewhat closely as regards symptoms with the one described by Orton (E. S. R., 30, p. 649). A description is given of potato mosaic, with an account of tests supposed to show that this disease is transmitted from mosaic parents, and that the yield from mosaic plants is less than half that from healthy stock. The trouble in Bermuda is thought to originate in the localities named from which the seed potatoes are obtained.

Report on potato diseases in Bermuda, W. A. Orton (*Rpt. Bd. Agr. Bermuda, 1914–15, pp. 13–15*).—Local conditions greatly favor *Phytophthora infestans,* the control of which requires thorough and frequent spraying by means of powerful spray pumps with improved nozzles to reduce the liquid to a fine mist, also rigid selection of seed potatoes, and, if possible, a more resistant variety than those now in use locally. Common scab (*Oospora scabies*), russet scab (Rhizoctonia), and blackleg are now of minor importance here. Curly dwarf and mosaic exist on the island, as does also a leaf roll which has not

been proved to be identical with the inheritable form found elsewhere. No powdery scab or wart disease has been reported from Bermuda, the inspection system appearing to be entirely adequate.

A new disease of sugar cane, J. A. Stevenson (*Porto Rico Dept. Agr. Sta. Circ. 11 (1917), Spanish Ed., pp. 12; noted in La. Planter, 59 (1917), No. 5, pp. 76–78; Agr. News [Barbados], 16 (1917), No. 401, p. 286*).—An account is given of a disease recently observed in Porto Rico, which is characterized by a peculiar mottling of the leaves. The leaves, however, differ distinctly from those affected with chlorosis in that they are marked with numerous white or yellow spots and stripes with irregular margins. Affected stools are said to be dwarfed, and in advanced stages of the disease the ratoons are very much stunted. The disease is capable of being transmitted through the planting of affected canes, and varieties seem to differ with regard to the extent to which they are susceptible to attack. No definite cause is as yet known, but the author suggests some similarity between this disease and the sereh disease of the East Indies.

Control measures recommended include increased fertilization, liming, thorough preparation of the soil, selection of disease-free seed, use of new land, and rotation of crops.

Bacterial leaf spot of tobacco, F. A. Wolf and A. C. Foster (*Science, n. ser., 46 (1917), No. 1189, pp. 361, 362*).—Leaf spot of tobacco is said to have been found in certain sections of North Carolina, where the disease, because of the rapidity with which it spreads, has been given the popular name "wild fire." The disease is said to manifest itself first in destructive form at the time of transplanting, and from observations it is believed that the trouble is introduced from the seed beds.

Leaf spot, it is stated, first appears as circular yellow spots about 1 cm. in diameter, with a minute brown area in the center of the spots. Within a few days the brown areas become enlarged to 2 or 3 cm. in diameter, and where the spots are numerous they fuse, giving large, brown, irregular areas which in severe cases involve most of the leaf tissue.

The authors have isolated a grayish-white bacterial organism, and inoculation experiments have proved that it is the cause of the disease. The organism appears to be undescribed, and the name *Bacterium tabacum* n. sp. is given it.

A detailed account of culture studies and inoculation experiments is reserved for a subsequent publication.

On a case of recovery from mosaic disease of tomato, W. B. Brierley (*Ann. Appl. Biol., 2 (1916), No. 4, pp. 263–266*).—In view of the alleged demonstration of the presence of mosaic virus in plants showing no external symptoms of the disease, the author has experimented with shoots apparently healthy, though springing from a diseased stock. Inoculation proved that the original plants suffered from an attack of this disease, also that the sap of the shoots apparently free does not produce infection. There remains the important question as to whether the new shoots growing out of the callcoed stock acquired immunity from the disease.

The leaf spot disease of tomato, G. H. Coons and E. Levin (*Michigan Sta. Spec. Bul. 81 (1917), pp. 15, figs. 7*).—Leaf spot of tomatoes due to *Septoria lycopersici* is described and directions given for spraying with Bordeaux mixture for its control.

Tomato diseases, H. W. Barre and J. L. Seal (*South Carolina Sta. Circ. 29 (1917), pp. 2*).—The wilts, leaf diseases, root knot, and fruit rots to which the tomato is subject are described and control measures, so far as any are known, are given.

Overwintering of the apple scab fungus, W. P. FRASER (*Science, n. ser., 46 (1917), No. 1186, pp. 280–282*).—The author reports having observed the apple scab fungus (*Venturia inæqualis*) on young shoots of the apple in the fall of 1915. Subsequent to that time, in different sections of Nova Scotia, a number of orchards have been examined where there was a severe twig injury due to scab.

The author is convinced that, at least near the coast, apple scab may overwinter on the twigs of susceptible varieties of apple, such as Fameuse and McIntosh, occurring as dormant stroma and producing abundant conidia in the spring. Observations made late in the fall indicate that the conidia are more resistant to low temperature than is generally supposed.

Three cedar rust fungi, their life histories and the diseases they produce, J. L. WEIMER (*New York Cornell Sta. Bul. 390 (1917), pp. 507–549, figs. 22*).—The author gives an account of investigations of the species of *Gymnosporangium* occurring on cedar, *G. juniperi-virginianæ*, which has for its alternate host the apple; *G. globosum*, which occurs also on quince, pear, and Cratægus; and *G. clavipes*, which attacks in its æcial form the quince and Cratægus.

Inoculations on Ribes with Cronartium ribicola, P. SPAULDING and G. F. GRAVATT (*Science, n. ser., 46 (1917), No. 1184, pp. 243, 244*).—In order to determine the possible resistance of species of Ribes to the white pine blister rust, the authors conducted inoculation experiments under controlled conditions on 82 varieties of cultivated red, black, and white currants, 23 varieties of cultivated gooseberries, and 42 species and hybrids of Ribes from various parts of the world.

The varieties of cultivated species of Ribes were found to show considerable variation in their susceptibility to disease.

In addition to the above species and hybrids, successful inoculations are reported on numerous unidentified species of Ribes, including over 100 collections made in the Northwest and Pacific Coast States. Thus far no species has proved to be entirely resistant to the rust.

[Plant diseases, 1914–15] (*Programm u. Jahresber. K. K. Höh. Lehranst. Wein u. Obstbau Klosterneuburg, 1914–15, pp. 64–70*).—A brief account is given of injury from Peronospora as related to variety and to treatments with Perocid, also of chlorosis as influenced by the use of iron salts.

Plant diseases and control (*Programm u. Jahresber. K. K. Höh. Lehranst. Wein u. Obstbau Klosterneuburg, 1915–16, pp. 76–79, fig. 1*).—This is a brief account of variety tests with several proprietary or standard preparations in connection with Peronospora on grapevines.

The question of curing roncet, E. PANTANELLI (*Staz. Sper. Agr. Ital., 49 (1916), No. 5–6, pp. 249–298*).—The author, in continuation of report and discussion regarding studies on the abnormality known as roncet (E. S. R., 28, p. 851), states that this condition tends to persist in shoots from the mother grapevine, although it may show a decrease or apparently disappear in summer with the increased root development. The actual nature and cause of the trouble are still unknown. Material taken from vines affected with this trouble apparently tends to produce vines equally affected. It has not been established that living material from affected plants, if given favorable soil or climate, will recover, hence rigorous avoidance of the use of all such material is recommended.

Dieback, or exanthema, of citrus trees, B. F. FLOYD (*Florida Sta. Bul. 140 (1917), pp. 31, figs. 15*).—The author gives a popular summary of information concerning this disease, its cause and treatment.

Dieback of citrus trees is said to be a disease of the growing tissues, the primary symptoms of which are the formation of gum pockets, the stained

terminal branches, the marked or ammoniated fruits, the bark excrescences, and the multiple buds. The secondary symptoms are an exceptionally deep green color of the foliage, a distorted growth of the immature angular terminal branches, frenching of the foliage, and thick, coarse, and somewhat peach-leaf shaped leaves.

The definite cause of dieback is not known, although it is supposed to be connected in some way with organic matter in the soil. Conditions known to be favorable to dieback are the presence of excessive quantities of ammoniates, a lack of drainage, hardpan too near the soil surface, excessive cultivation, and irregular moisture conditions.

The disease may be controlled by correcting the above soil conditions, and affected trees may be cured by the use of copper sulphate on the soil and beneath the bark of the trees and by spraying with Bordeaux mixture.

Armillaria root rot on the English walnut, K. PEARCY (*Amer. Nut Jour.*, *6 (1917), No. 6, p. 85*).—Giving the results of experience with Armillaria root rot attacking English walnuts of all ages and at all seasons locally, the author states that where the dirt was dug away until the graft unions were exposed, cylinders of heavy roofing paper placed around the bases of the trees, and the soil filled in around them afterwards, no more trees were lost in that planting. These cylinders have to be kept cleaned out each year of such dirt as may fall into them during cultivation. Holes where dead trees have been dug out must be left open to the sunshine for a time to kill any portions of the fungus that may be exposed.

A new disease of cultivated Pelargonium, A. LINGELSHEIM (*Ztschr. Pflanzenkrank., 26 (1916), No. 6–7, pp. 375–378, figs. 2*).—A brief description and discussion are given of a speckled appearance twice observed in young leaves of Pelargonium. The phenomenon becomes more apparent in the older leaves. The cause is thought to be defective development of some of the parenchymal cells as regards size and chlorophyll content. The observed phenomena are compared with some reported by other authors.

Hybrids and other new chestnuts for blight districts, W. VAN FLEET (*North. Nut Growers Assoc. Proc., 7 (1916), pp. 54–58*).—It is stated that no diminution in the virulence of the chestnut-bark disease is yet apparent, the disease having spread within a little more than ten years from a point near New York City into 13 States, practically reaching the eastern and northern limits of chestnut growth and sparing no individual trees exposed to infection, so that the American chestnut as a forest asset is likely soon to disappear.

Chestnut trees are killed in a short time, though a duration of five to eight years has been noted. The fungus probably does not, however, attack very harmfully even closely allied forms. Certain Asiatic forms, as *Castanea crenata* of Japan and eastern China and *C. molissima* of the interior are most promising in this respect. *C. sativa*, the commercial chestnut of Europe, has a resistance somewhat higher than that of *C. americana*. *C. pumila* often escapes infection owing, supposedly, to its small size, smooth bark, and comparative freedom from insect attack.

Crosses of chinquapin with Japanese chestnut have shown a hopeful degree of resistance or of recuperative power, and some of these show considerable promise as nut producers in regard to quantity and quality, early ripening, and vigor of the trees. Observations and tests are still in progress.

New hosts for Razoumofskya americana and R. occidentalis abietina, J. R. WEIR (*Phytopathology, 7 (1917), No. 2, p. 140*).—The author reports the occurrence of *R. americana* on *Pinus attenuata* and of *R. occidentalis abietina* on *Abies nobilis* and *A. amabilis*.

Report on the South American leaf disease of the Para rubber tree, C. K. Bancroft (*Reprint in Jour. Bd. Agr. Brit. Guiana, 10 (1916), No. 1, pp. 13–33*).—It is stated that the leaf disease of Hevea appeared sporadically in British Guiana in 1909 and more abundantly in 1914, and that it is now more or less prevalent in all parts of the colony except along the coast. It is said to be caused by *Fusicladium macrosporum.*

The characteristic symptom is the dying back of the branches toward the stem. The rapidly reproducing form of spores occurs on young leaves and twigs recently attacked, the other two (which may supposedly together represent a resting stage) occur principally on old and fallen leaves. The same disease is said to occur in Dutch Guiana and in Brazil.

The leaf disease is affected by dryness (tending to defoliation) and by a high day temperature. Leaves are most susceptible to attack when one or two weeks old and 3 to 5 in. long. The disease has been observed on two wild forest species of Hevea, but on no other wild plants.

A Bordeaux spray is recommended. Sanitary measures include open planting; removal of fallen leaves, dead wood, and wild Hevea; and treatment of wounds with tar or some other reliable disinfectant.

Control measures for the South American Hevea leaf disease, G. Stahel *Meded. Dept. Landb. Suriname, No. 6 (1916); Indische Mercuur, 39 (1916), No. 43, pp. 986, 987*).—This is a reprint of a pamphlet summarizing the contents of a forthcoming bulletin.

The author states that the Hevea leaf disease fungus has three forms of fructification, perithecia, pycnidia, and conidia, all of which were studied, the conidia (the Scolecotrichum form of fructification) proving to be almost the sole means of propagation used by the fungus. While full-grown leaves are somewhat resistant, young leaves are readily infected.

It is recommended that occasionally the young leaves and shoots be kept down on affected estates for a period of from two to four weeks. Measures proposed by Bancroft in his article above noted are criticized.

Fighting the South American leaf disease of Hevea (*Jour. Bd. Agr. Brit. Guiana, 10 (1916), No. 1, pp. 1–4*).—This note refers to the work by Bancroft and summarizes that of Stahel, both of which are noted above.

An abnormal leaf fall in Hevea, P. Arens (*Meded. Proefstat. Malang, No. 14 (1916), pp. 6–13*).—In two cases of premature leaf fall observed to occur during the heavy rains in the Malang country, a parasitic fungus was found which is said to be *Neozimmermannia* (*Glœosporium*) *elasticæ.* No definite result followed artificial infection with the organism, which may therefore depend upon the sensitizing effects of wet weather. The leaf-fall organism of India (*Phytophthora* sp.) and the one found in Surinam have not yet appeared in this archipelago.

The efficacy of acid, neutral, or alkaline Bordeaux mixture, V. Vermorel and E. Dantony (*Notes Expérimentales sur l'efficacité des Bouillies Bordelaises Acides, Neutres et Alcalines. Villefranche: Prog. Agr. et Vit., 1917, pp. 28, figs. 3*).—Discussing the conflicting conclusions of various workers regarding the relative values of acid, alkaline, and neutral Bordeaux mixture, the authors give an account of tests made by them during 1915 and 1916 in which grape leaves, after having been sprayed, were detached day after day and tested for the presence of soluble copper.

The results led to a certain modification of the views previously expressed (E. S. R., 34, p. 540). It was found that in case of acid spray nearly all of the soluble copper disappeared in two or three weeks or even during one good rain, while in case of the alkaline solution a considerable portion of copper

remained in soluble and available form for as long as 50 days in spite of repeated rains. The alkaline Bordeaux mixture is therefore preferred.

Acid or alkaline sprays, V. Vermorel and E. Dantony (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 38 (1917), No. 18, pp. 428, 429*).—In a summary of the results of recent work on Bordeaux mixtures differing in composition, the authors state that the alkaline and the acid preparations differ widely as regards their actual constitution. The acid mixture is not constituted of copper sulphate and lime in a mere mechanical mixture, but is formed of a basic sulphate and of a small quantity of normal sulphate. The alkaline preparation is entirely different, being a mixture having a great excess of sulphates of copper of very high basicity and of double sulphates of copper and lime. The authors think that there are also hydrates of copper and of lime in excess of the calcium sulphate present. A constituent common to both these forms is calcium sulphate.

Under the action of rain, as of chemical reagents, the two mixtures behave differently, the alkaline being much the more lasting. This fact is discussed, as are others, with advice against certain preparations. The authors advise strongly against the employment of the acid spray. It is claimed that excess of lime (which is regarded by some as to be avoided) is not in any way injurious.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The muskrat as a fur bearer, with notes on its use as food, D. E. Lantz (*U. S. Dept. Agr., Farmers' Bul. 869 (1917), pp. 22, figs. 4*).—This abridgement and revision of Farmers' Bulletin 396 (E. S. R., 23, p. 356) calls attention to the importance of the muskrat as a fur bearer and suggests the utilization of private ponds and marsh lands for an increased production of fur and meat.

The mongoose in Barbados, W. Nowell (*Agr. News [Barbados], 16 (1917), No. 396, p. 206*).—The author holds the view that the increasing damage to crops by insect pests in Barbados is to a large extent due to the destruction of birds, lizards, and toads by the mongoose.

Recognition among insects, N. E. McIndoo (*Smithsn. Misc. Collect., 68 (1917), No. 2, pp. 78*).

A manual of dangerous insects likely to be introduced in the United States through importations, edited by W. D. Pierce (*U. S. Dept. Agr., Office Sec. [Pub.], 1917, pp. 256, pls. 50, figs. 107*).—This manual has been prepared by the Bureau of Entomology in cooperation with the Federal Horticultural Board with a view to supplying such information as is required by their officers and others in the enforcement of quarantines and the safeguarding of this country against the introduction of foreign insect pests. A brief sketch of each of the more important insects and certain important facts concerning each plant on which they are likely to be introduced are given. The host plant arrangement has been followed, under each of which are grouped, first, the better known insects and, second, those not so well known or concerning which descriptive matter is not available. Insect and plant indexes are included.

Insects of 1916 [in Maryland], E. N. Cory (*Rpt. Md. Agr. Soc., 1 (1916), pp. 200–208, pl. 1*).—A brief account is given of the more injurious of some 60 insect pests of the year, including several orchard plant lice, namely, the apple aphis, oat aphis (*Aphis avenæ*), and rosy aphis (*A. sorbi*). The new peach pest *Laspeyresia molesta*, which has appeared in three localities on the western shore of Chesapeake Bay but not as yet on the eastern shore, codling moth, striped turnip flea-beetle (*Phyllotreta vittata*), cabbage worms (*Pieris rapæ* and *Plusia brassicæ*), garden flea hopper (*Halticus citri*), strawberry leaf

beetle (*Typhophorus canellus*), rose midge (*Dasyneura rhodophaga*), phlox plant bug (*Lopidea media*), and catalpa midge (*Cecidomyia catalpæ*) are also noted.

Sixteenth report of the State entomologist of Minnesota to the governor for the years 1915 and 1916, F. L. WASHBURN (*Rpt. State Ent. Minn., 16 (1915–16), pp. 189, pl. 1, figs. 54*).—A report on the Work on the White Pine Blister Rust in Minnesota, 1916, by F. L. Washburn (pp. 10–27) is followed by a Report on Nursery and Orchard Inspection and Inspection of Foreign Stock for the Years 1915–16, by F. L. Washburn (pp. 28–58) ; Miscellaneous Notes on Economic Work; Orchard and Shade Tree Insects, Spraying, Truck, and Field Crops, by A. G. Ruggles (pp. 59–64) ; Notes on Parasitic and Household Insects, by C. W. Howard (pp. 65–67) ; The White-Marked Tussock Moth, by A. G. Ruggles (pp. 68–70) ; Distribution of Fish to Minnesota Farmers, by F. L. Washburn (pp. 71, 72) ; The Common Mosquitoes of Minnesota, by C. W. Howard (pp. 73–92) ; Studies in Greenhouse Fumigation with Hydrocyanic Acid—Temperature and Moisture as Factors Influencing the Injury of Plants During Fumigation, by W. Moore (pp. 93–108) ; The Strawberry Weevil in Minnesota (*Anthonomus signatus*) (pp. 109–134), noted on page 163, and Insects Attacking Weeds in Minnesota (pp. 135–152), by S. Marcovitch; Minnesota Billbugs, by O. G. Babcock (pp. 153–159) ; and Further Observations on Minnesota Birds, Their Economic Relations to the Agriculturist, by F. L. Washburn (pp. 160–183).

[Insect pests in New Hampshire], W. C. O'KANE (*N. H. Dept. Agr., State Moth Work Circ.* [*1915*], *Nos. 7, p. 1, fig. 1; 8, pp. 4;* [*1916*], *Nos. 10, pp. 3; 11, pp. 24, pls. 8*).—These several circulars deal with grasshopper control, insect suppression-organization work, control of grasshoppers, and plan and progress of the work in 1915 and 1916, respectively.

[Report of the] division of entomology, J. G. SANDERS and S. B. FRACKER (*Wis. Dept. Agr. Bul. 10 (1916), pp. 30–58, figs. 17*).—This report deals with the inspection of nurseries and material imported into Wisconsin, white grub and grasshopper work, etc. Under the heading of Insect Notes for 1916 brief accounts are given of the onion maggot (*Hylemyia antiqua*), the poplar weevil (*Cryptorhynchus lapathi*), the cottony maple scale which is causing the death of maples, raspberry insects (particularly caterpillars of *Schreckensteinia festaliella*), a new orchid weevil (*Cholus cattleyæ* [*cattleyarum*]) which is a source of loss in Milwaukee, and the chrysanthemum leaf miner (*Napomyza chrysanthemi*).

In reporting upon the results obtained from the use of the poison bait spray for the onion maggot (E. S. R., 33, p. 357) it is stated that only partially successful results were obtained during 1915 and 1916, due in part to unusually wet weather. It was found that a spray consisting of ½ oz. of sodium arsenite or white arsenite, dissolved in 1 gal. of boiling water to which ½ pint to 1 pint of black New Orleans molasses was added, was made much more attractive through soaking chopped onion in it for a time until the bait acquired a strong onion odor.

A report on apiary inspection by N. E. France (pp. 56–58) is also included.

Insects affecting agriculturists in British Columbia during the past year, R. C. TREHERNE (*Agr. Jour.* [*Brit. Columbia*], *1 (1916), No. 10, p. 168; abs. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 3, pp. 120, 121*).—This reports upon the occurrence of the more important insects of the year in British Columbia.

Proceedings of the Entomological Society of Nova Scotia for 1916 (*Proc. Ent. Soc. Nova Scotia, 1916, pp. 64, pls. 9, figs. 13*).—The papers here presented relating to economic entomology are as follows: Some Results from a Few

Combination Sprays in 1916, by W. H. Brittain (pp. 9–12); How to Collect and Preserve Insects, by L. A. DeWolfe (pp. 12–15); The Nova Scotia Division of Entomology, by W. H. Brittain (pp. 15–17); The Effect of Certain Combinations of Spraying Materials on the Set of Apples, by G. E. Sanders (pp. 17–21); The Acrididæ of Nova Scotia, by C. B. Gooderham (pp. 21–30); Notes on the Apple Seed Chalcis (*Syntomaspis druparum*), by W. H. Brittain (pp. 30, 31); Biting Insects Injuring the Fruit of the Apple in Nova Scotia, by G. E. Sanders (pp. 31–33); Notes on Two Species of Tree Hoppers (Membracidæ) Ovipositing in the Apple, namely, *Ceresa taurina* and *C. bubalus*, by W. H. Brittain (pp. 34–39); Arsenate of Lead Versus Arsenate of Lime, by G. E. Sanders (pp. 40–45); The Dock Sawfly (*Ametastegia glabrata* [*Taxonus nigrisoma*]), by A. G. Dustan and F. C. Gilliatt (pp. 45–48); Notes on the Rose Leafhopper (*Empoa rosæ*) in Nova Scotia, W. H. Brittain and L. G. Saunders (pp. 48–51); Notes on the Rosy Aphis (*Aphis malifoliæ*) in Nova Scotia, by W. H. Brittain (pp. 51–55); and The Toxic Value of Some Common Poisons Alone and in Combination with Fungicides, on a Few Species of Biting Insects, by G. E. Sanders and W. H. Brittain (pp. 55–64).

Experiments by Sanders on a small scale indicate what other field observations, show, namely, that with excessively dilute fungicide solutions or alone arsenate of lime is highly dangerous to foliage, but in some manner normal solutions of lime-sulphur, barium tetrasulphid, Bordeaux, and to a great extent solutions of sodium sulphid (soluble sulphur) protect arsenate of lime from the carbon dioxid of the air and so reduce or prevent injury from it. His conclusions are substantially as follows:

Arsenic in arsenate of lime is much cheaper than in arsenate of lead, in Nova Scotia being less than 55 per cent of the cost in arsenate of lead. Per content of arsenic there is slight difference in killing power in favor of arsenate of lead. Arsenate of lime is more desirable from every standpoint to use with sulphid sprays, but should never be used alone on foliage. Lead arsenate is the best poison to use alone. Lead arsenate seems to work slightly better with Bordeaux mixture, but arsenate of lime is cheaper, so that the question of which to choose for use with Bordeaux mixture is a matter of convenience.

The studies by Brittain on the rosy aphis in Nova Scotia are in continuation of those reported in a paper previously noted (E. S. R., 35, p. 853). Data relating to the generations of the rosy aphis in 1916 are presented in tabular form and a chart is given showing the occurrence of ten generations during the year.

In reporting tests of the toxic value of some common poisons, both alone and in combination with fungicides, Sanders and Brittain present data, largely in tabular form, relating to their effect upon the brown-tail moth, tent caterpillar, fall cankerworm, white-marked tussock moth, and fall webworm. "From a study of these tables we find that the carrier of the poison, i. e., the fungicide to which it is added, has a very marked effect on its efficiency. The effect of each, calculated from the average total, may be summarized as follows:

"The four poisons used in this experiment [arsenate of lime, barium arsenate, triplumbic lead arsenate, and acid lead arsenate], when employed in combination with sodium sulphid (soluble sulphur) were 13.1 per cent more efficient than when used alone. When the poisons were added to a mixture of barium tetrasulphid and sodium sulphid their efficiency was reduced by 6.4 per cent, while, added to lime-sulphur the reduction in efficiency amounted to 19.2 per cent. Barium tetrasulphid reduced their toxic value 16 per cent and Bordeaux mixture 43.5 per cent.

"It would thus appear that with one exception, fungicides inhibit the action of arsenical poisons used in combination with them, the exception being sodium sulphid, which noticeably increases their killing power. This very marked effect

of the fungicides on the action of the poisons is difficult to explain fully. The effect of the sodium sulphid in increasing the toxicity of the various poisons is apparently due to the presence of the element sodium. A portion, at least, of its action consists, we believe, in its effect in increasing the palatability of the leaves, resulting in the larvae eating ravenously for a few days. They thus get a large amount of poison into their system in a short time, resulting in their more rapid death. The sodium sulphid also has the effect of rendering the metallic arsenates, such as lead arsenate, more active (and more dangerous to foliage) by acting upon them chemically, forming sodium arsenate and a metallic sulphid."

New records of entomogenous fungi in Barbados, W. Nowell (*Agr. News [Barbados], 16 (1917), No. 389, p. 94*).—The author records the common occurrence of three species of fungus parasites of insects on the leaves of lime trees, namely, the common fungus *Verticillium heterocladum* on a species of citrus white fly, *Aschersonia* (*cubensis?*) on star scale (*Vinsonia*), and *Ophionectria coccicola* on purple scale.

[Entomological progress in India] (*Rpt. Prog. Agr. India, 1915–16, pp. 50–57*).—A brief summary of the more important results of work for the year ended June 30, 1916.

Control of some of the important garden and truck crop insects, T. J. Talbert (*Univ. Missouri, Agr. Ext. Serv. Circ. 15 (1917), pp. 24, figs. 19*).—A popular summary of information on these insects and means for their control.

The olive insects of California, E. O. Essig (*California Sta. Bul. 283 (1917), pp. 43–64, figs. 21*).—A discussion of the olive insects of California and measures for their control. The more important insects considered are the black scale, the ivy or oleander scale (*Aspidiotus hederæ*), the branch and twig borer (*Polycaon confertus*), and the olive bark beetle (*Luperisinus californicus*). Those of minor importance to olive trees in California include the orange thrips, the bean thrips (*Heliothrips fasciatus*), the net-winged cicada (*Platypedia areolata*), the mountain-ash louse (*Pemphigus fraxini-dipetalæ*), the red scale (*Chrysomphalus aurantii*), the purple scale, the greedy scale (*A. camelliæ*), the omnivorous looper (*Sabulodes caberata*), and larvæ of a pyralid moth.

Brief notes on some of the principal insects attacking the olive trees in other States and foreign countries are also included.

Important pecan insects and their control, J. B. Gill (*U. S. Dept. Agr., Farmers' Bul. 843 (1917), pp. 48, figs. 58*).—This contribution from the Bureau of Entomology reports the results of studies of the more important pecan insects, the damage caused by which amounts to hundreds of thousands of dollars annually. The insects considered in detail are the pecan nut case bearer (*Acrobasis hebescella*), the pecan shuckworm (*Laspeyresia caryana*), and the pecan weevil (*Balaninus caryæ*), which injure the nuts; the pecan leaf-case bearer (*A. nebulella*), the pecan cigar-case bearer (*Coleophora caryæfoliella*), the pecan bud moth (*Proteopteryx bolliana*), the fall webworm, the walnut caterpillar (*Datana integerrima*), the hickory phylloxera (*Phylloxera caryæcaulis*), and the little hickory aphid (*Monellia caryella*), which injure the foliage and shoots; white ants or termites (*Leucotermes flavipes*), the oak or hickory cossid (*Cossula magnifica*), the flat-headed apple-tree borer, the red-shouldered shot hole borer ([*Sinoxylon*] *Xylobiops basilaris*), the belted chion (*Chion cinctus*), the hickory twig girdler (*Oncideres cingulatus*), the oak pruner (*Elaphidion villosum*), and scale insects, which injure the trunk and branches.

[Insect enemies of the coconut palm in Netherlands Indies and their control], P. E. Keuchenius (*Teysmannia, 27 (1917), No. 11–12, pp. 579–642, pls. 8*).—A summary of information on the more important coconut insects.

Studies in greenhouse fumigation with hydrocyanic acid.—Temperature and moisture as factors influencing the injury of plants during fumigation, W. Moore (*Rpt. State Ent. Minn., 16 (1915–16), pp. 93–108, figs. 6*).—The studies here reported are summarized as follows:

"Hydrocyanic acid may enter a plant either through the stomata or directly through the cuticle. The amount of hydrocyanic acid which will enter the cuticle of the plant depends upon the thickness and the degree to which it has been cutinized.

"Moisture on the leaves aids the gas to penetrate, but is not so important a factor where the house contains only plants with thick, heavy cuticles. Moisture may be present on the leaves from sprinkling the plants or from exudation of water from the water pores. High relative humidity at the time of fumigation aids the penetration of the gas through the cuticle, thus favoring injury. High relative humidity after fumigation tending to prevent evaporation of hydrocyanic acid in the cuticle of the plant tends to increase injury to the plants. Low temperatures at the time of fumigation and after act in a similar manner to a high relative humidity. High temperature by increasing evaporation produces results similar to a low relative humidity. Both high relative humidity and low temperature have less influence on plants with thick, waxy leaves."

Notes on American Tingidæ with descriptions of new species, H. Osborn and C. J. Drake (*Ohio Jour. Sci., 17 (1917), No. 8, pp. 295–307, figs. 2*).—This paper presents notes on 33 species, of which 10 species and 1 variety are described as new. Information on the food plants of many of the species is included.

The sugar cane froghopper in Grenada, J. C. Hutson (*Agr. News [Barbados], 16 (1917), No. 389, p. 90*).—Investigations made by C. B. Williams in December, 1916, show that *Tomaspis saccharina* has been established in Grenada for many years. Actual damage to canes was reported from two estates, on one of which the injury was fairly severe.

The common mealy bug and its control in California, R. S. Woglum and J. D. Neuls (*U. S. Dept. Agr., Farmers' Bul. 862 (1917), pp. 16, figs. 4*).—Control measures for the citrus mealy bug, which continues to spread in California, are discussed under the headings of fumigation, spraying, and control by natural enemies. The sphere of usefulness of each and the way in which they may be combined to secure complete control are pointed out.

The banding of trees with a mixture consisting of sulphur and a sticky material to keep the Argentine and other ants off the trees forms an important part in its control. Where insect enemies are few or absent, or where the mealy bugs are themselves heavily parasitized, the trees should be sprayed or fumigated and colonies of effective enemies introduced.

The black fly and methods of controlling it (*Agriculture [Cuba], 1 (1917), No. 5, pp. 43–49, figs. 3*).—This is an account of *Aleurocanthus woglumi*, discovered in Cuba in August, 1915, as previously noted (E. S. R., 35, p. 552), and measures of suppression now under way. The pest has been recently found in various gardens at Vedado, Havana.

Chermes attacking fir trees, N. A. Kholodkovskiĭ (*Khermesy Vredíashchíe Khvoĭnym Derev'íam. Petrograd: Glav. Uprav. Zemleustr. i Zemled., 1915, pp. 91, pls. 7, figs. 6*).—The author deals at length with the chermes occurring on fir trees, 11 species being considered.

Some notes on the mealy plum aphid, Hyalopterus pruni, F. C. Willcocks (*Bul. Soc. Ent. Egypte, 9 (1916), No. 2, pp. 33–37; abs. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 5, p. 188*).—This aphid, which is said to be prevalent in Egypt

in the spring on apricot and peach trees, is widely distributed in Europe and North America. Its habits in Egypt are the same as in America.

Aphis sprays, T. O. MORRISON (*[Bien.] Rpt. Dept. Agr. Wash., 2 (1915–16), pp. 93, 94*).—Tests of a number of insecticides for the control of aphids led to the conclusion that tobacco sprays are the most effective. Experiments carried on with a view to lowering the cost of such applications have led to the conclusion that the effectiveness of blackleaf 40 is greatly increased by the addition of lime.

Notes on Pediculus humanus (vestimenti) and P. capitis, A. BACOT (*Brit. Med. Jour., No. 2892 (1916), pp. 788, 789*).—These observations, which are substantially noted from another source (E. S. R., 37, p. 850), deal with the habits, length of life, and incubation of eggs of the body and head lice.

Tobacco hornworm insecticide: Recommendations for use of powdered arsenate of lead in dark-tobacco district, A. C. MORGAN (*U. S. Dept. Agr., Farmers' Bul. 867 (1917), pp. 10*).—This supersedes Farmers' Bulletin 595 (E. S. R., 31, p. 454). It gives additional recommendations for the use of powdered arsenate of lead in the control of the tobacco hornworm, based upon the results secured by agents of the Bureau of Entomology working in cooperation with tobacco growers in Kentucky and Tennessee. The use of diplumbic arsenate of lead, guaranteed to contain at least 30 per cent of arsenic oxid, of which not more than 1 per cent is free or water soluble, is strongly recommended.

The fall army worm (Laphygma frugiperda) in its relation to cranberry bogs, H. B. SCAMMELL (*Proc. Amer. Cranberry Growers' Assoc., 47 (1917), pp. 11–13*).—A brief account of the attack of the cranberry in New Jersey by this army worm.

[Gipsy and brown-tail moth work in Massachusetts], F. W. RANE (*Ann. Rpt. State Forester Mass., 12 (1915), pp. 81–85*).—Brief statements of the work with parasites of the gipsy and brown-tail moths carried on by the U. S. Department of Agriculture in cooperation with the State of Massachusetts are given by L. O. Howard (pp. 81, 82) and A. F. Burgess (pp. 82–84).

The invasion of cranberry bogs by the gipsy moth was the most serious new development in connection with work with this pest.

New microbe parasites of the caterpillar of the gipsy moth, A. PAILLOT (*Compt. Rend. Acad. Sci. [Paris], 164 (1917), No. 13, pp. 525–527*).—The author has isolated three bacterial forms that attack the gipsy moth. These are (1) a coccobacillus identified provisionally as that described in 1913 by Picard and Blanc under the name *Bacillus lymantriæ* (E. S. R., 30, p. 54); (2) a gram-positive diplococcus which differs from that found in the cockchafer and to which the author gives the name *Diplococcus lymantriæ;* and (3) a gram-positive bacillus to which is given the provisional name *Bacillus liparis.* The mortality resulting from *B. lymantriæ* is very low, and *D. lymantriæ* is only mildly pathogenic, while *B. liparis* is more pathogenic than is *D. lymantriæ.*

Measures employed in controlling the grapevine worm in Vaudois vineyards in 1916, H. FAES (*Traitements Effectués dans le Vignoble Vaudois en 1916 contre le Ver de la Vigne (Cochylis). Lausanne: Sta. Vit. Lausanne, 1917, pp. 23, figs. 4*).—This is a report of control work with the cochylis moth.

[Automeris janus attacking cacao trees] (*Dept. Agr. Trinidad and Tobago, Bul. 16 (1917), No. 1, pp. 21–23, pl. 1*).—A brief note on *A. janus* is given by N. Lamont and a note on its parasite by F. W. Urich. This moth is found commonly in Trinidad on cacao trees and bois immortel (*Erythrina umbrosa* and *E. velutina*). That it is not a source of greater injury is said to be due to the presence of a tachinid parasite (*Willistonia esuriens*).

The olfactory organs of Lepidoptera, N. E. McIndoo (*Jour. Morph., 29 (1917), No. 1, pp. 33–54, figs. 10*).

A classification of the Lepidoptera based on characters of the pupa, Edna Mosher (*Bul. Ill. State Lab. Nat. Hist., 12 (1916), Art. 2, pp. 13–160, pls. 9*).—In this presentation of a classification of Lepidoptera, based on pupal characters, an attempt is made to throw some light on the relationships existing between the different groups.

Anopheles punctipennis.—A note on its ability to serve as a host for Plasmodium falciparum, M. B. Mitzmain (*Pub. Health Rpts. [U. S.], 32 (1917), No. 27, pp. 1081–1083*).—Further experiments (E. S. R., 35, p. 361) have shown that *A. punctipennis* is easily infectible with *P. falciparum.* One individual of a series of 16 mosquitoes and 13 individuals of a series of 36, fed a single time, were observed to become infected. Four of 8 individuals of *A. quadrimaculatus* used as controls developed infections. It is pointed out that the experimental determination of the rôle of *A. punctipennis* as a potential host for the organisms of tertian (*P. vivax*) and subtertian or estivo-autumnal (*P. falciparum*) malaria has been established by King (E. S. R., 35, p. 360).

"The present status of the common American anophelines with reference to their susceptibility to infection with the several species of malarial parasites is as follows: *A. quadrimaculatus* may serve as a host for all three parasites of malaria. *A. punctipennis* and *A. crucians* are susceptible to infection with *P. vivax* and *P. falciparum.*"

A preliminary note on the rôle of blood in evolution in Culicidæ, S. K. Sen (*Indian Jour. Med. Research, 4 (1917), No. 4, pp. 729–753, figs. 2*).—The author considers the experiments thus far conducted to justify the conclusions that with *Stegomyia scutellaris* the deposition of eggs is possible without any meal of blood, that an initial meal of blood may sometimes suffice for as many as three batches of eggs, and that a single fertilization suffices for several batches of eggs.

Chrysanthemum midge, A. D. Borden (*Amer. Florist, 48 (1917), No. 1513, pp. 1061, 1062, figs. 3*).—A brief account is given of *Diarthronomyia hypogæa,* an imported European gall fly now thoroughly established in the United States, which is rapidly being distributed from State to State on infested chrysanthemum plants and cuttings. It has been known to occur in California for about 15 years, although the first published record was by Felt from Michigan in April, 1915 (E. S. R., 36, p. 855). Since this time evidence of its infestation of chrysanthemums grown under glass has been obtained from Oregon, New Jersey, Connecticut, Indiana, Pennsylvania, and Ottawa, Canada. During 1917 a number of florists reported a total loss of their chrysanthemum stock. Even in the case of a light infestation the foliage is ruined for commercial purposes, and in a heavy infestation the growth of the plants is completely arrested. Thus it is imperative in purchasing new plants and cuttings to insist on plants free from the chrysanthemum midge.

The house fly and its control, L. Haseman (*Univ. Missouri, Agr. Ext. Serv. Circ. 16 (1917), pp. 11, figs. 4*).—A popular summary.

Screw worms and other maggots affecting animals, F. C. Bishopp, J. D. Mitchell, and D. C. Parman (*U. S. Dept. Agr., Farmers' Bul. 857 (1917), pp. 18, figs. 9*).—A brief descriptive account of several kinds of flies which infest wounds and deposit eggs on soiled wool on sheep and means for their control.

The life of the adult screw worm fly is comparatively short, ranging from 2 to 6 weeks, during which time it feeds upon various kinds of refuse and to some extent upon the nectar of flowers. The eggs are laid in batches from 1 to 4 days apart, each mass containing from 40 to 250 eggs. A single female has

been observed to deposit as many as 8 batches of eggs, containing a total of 1,228. In moist, warm weather they hatch in less than 3 hours after deposition. In living animals the larvæ mature in from 4 to 5 days. From 3 to 14 days are passed in the pupal stage. The entire life cycle is completed in from 1 to 4 weeks, depending on the temperature and humidity.

The complete destruction of all dead animals is said to be the best method of control.

Other flies infesting wounds, including the sheep wool maggots, brief mention of which is made, are the black blowfly (*Phormia regina*), the green bottle fly (*Lucilia sericata*), and the gray flesh flies (*Sarcophaga texana.*, *S. tuberosa sarracenioides*, and *S. robusta*).

A preliminary classification of Diptera, exclusive of Pupipara, based upon larval and pupal characters with keys to imagines in certain families, I, J. R. MALLOCH (*Bul. Ill. State Lab. Nat. Hist., 12 (1917), Art. 3, pp. V+161–410, pls. 30, fig. 1*).—This work was prepared in response to a demand for analytical keys to the immature stages of Diptera.

The Colorado potato beetle, T. O. MORRISON (*[Bien.] Rpt. Dept. Agr. Wash., 2 (1915–16), pp. 100–103*).—The appearance of the Colorado potato beetle at Sunnyside, Wash., early in July, 1916, is recorded. A survey which was at once made demonstrated the presence of this pest in 14 patches, and eradication work by means of sprays and hand picking was immediately commenced.

The white grubs injuring sugar cane in Porto Rico.—I, Life cycles of the May beetles or melolonthids, E. G. SMYTH (*Jour. Dept. Agr. P. R., 1 (1917), No. 2, pp. 47–92, pls. 8*).—In this first part the author deals with the May beetles of the tribe Melolonthini, of which five species have been studied in Porto Rico, a reference to which has been noted (E. S. R., 36, p. 753). All five of these melolonthids are new to science, and four belonging to the genus Phyllophaga are being described by the author under the names *P. vandinei*, *P. portoricensis*, *P. guanicana*, and *P. citri*, as well as a single species belonging to the genus Phytalus under the name *P. insularis*. A discussion first given of the white-grub problem and of the white grubs of Porto Rico and elsewhere is followed by accounts of life-history work elsewhere, life cycles, enemies in Porto Rico, methods of rearing, etc. The life-history studies have shown that all four of these species of Phyllophaga and the single species of Phytalus require but a single year and sometimes less to undergo their life cycles.

P. vandinei, the larva of which is the worst sugar-cane pest of the island and perhaps one of the three most injurious sugar-cane white grubs in the world, is restricted to the western third of the island, having been recorded only as far east as Manatí on the north coast and at Peñuelas on the south. It has reached such great abundance in this territory, particularly in the Guánica district, as to have caused whole fields of cane to fall and begin to sour in a week's time after damage first became evident. It has made the growing of ratoon cane in the Guánica and San Germán districts impossible, and in addition to the cost of replanting for each crop has necessitated the continued hiring of boys to collect the grubs and beetles at a cost of hundreds of dollars in a single season. It is stated that there are cases on record where over 50 grubs of this species have been spaded out from under a single stool of cane, and it is not an uncommon occurrence to dig out 20 or more grubs from one cane stool. Due to its great abundance in the heart of the worst-infested district, where the laboratory is located, a large proportion of the studies were made of this species, the details of which are presented.

The eggs are deposited among roots in the soil in small globular pits or cavities, one egg being deposited in each pit. The average incubation period for 1,089 eggs was 14 days, the maximum 17 days in March and the minimum

10 days in September. The average period required for the development of the larva was 267 days, the maximum 356 days and the minimum 179 days, during which time 3 molts were passed. The prepupal stage was found to vary from 4 to 7 days and the average duration of the pupal stage was 21.5, the maximum being 26 and the minimum 17 days. The average normal egg-to-adult period based upon 14 complete records of single individuals was 306 days, the maximum 395 days and the minimum 212 days.

The adults differ from many species of the genus in that they are very general feeders, there being few plants that they will not touch. Experiments have shown that ordinarily the adults are only attracted to light during their flight and before they have settled on foliage to feed, i. e., from 4 to 7.30 p. m. In order to have any practical efficiency in attracting the adults of this species the lights must be placed close to the ground and started immediately at dusk, while the beetles are flying.

Mention is made of three species of birds that are important enemies of white grubs in Porto Rico and of a predacious wireworm (*Pyrophorus luminosus*). Their parasites include six scoliids (*Elis sexcincta*, *E. xanthonotus*, *Campsomeris dorsata*, *C. trifaciata*, *C. pyrura*, and *Scolia atrata*), and two tachinids (*Cryptomeigenia aurifacies* and *Eutrixoides jonesii*). The eggs are attacked by mites and nematodes.

A bibliography of 36 titles is included.

White grub investigation.—A brief report of progress, A. Gibson (*Agr. Gaz. Canada, 4 (1917), No. 7, pp. 554–556, figs. 2*).—A brief statement of progress in the work on white grubs.

Existence of many varieties and races of coccobacilli in the natural septicemias of the cockchafer, A. Paillot (*Compt. Rend. Acad. Sci. [Paris], 163 (1916), No. 19, pp. 531–534*).—The author recognizes four types of *Bacillus melolonthæ*, one representing the variety to which he gives the name *B. melolonthæ liquefaciens*, and the other three, the variety *B. melolonthæ nonliquefaciens*. Studies of a bacterial disease of the cockchafer in this country by Northrup have been noted (E. S. R., 32, p. 61).

New microbe parasites of the cockchafer, A. Paillot (*Compt. Rend. Acad. Sci. [Paris], 163 (1916), No. 24, pp. 772–774; abs. in Jour. Roy. Micros. Soc., No. 2 (1917), p. 249*).—While the septicemia caused by coccobacilli appear to be the principal cause of the natural mortality in cockchafers, it is not always possible to obtain pure cultures of the causative coccobacillus from the blood of affected individuals. In fact, in some 30 per cent of the cases a secondary infection accompanies the coccobacillemia. Three different associated diseases have been studied and all found in cockchafers from the Plateau of Sathonay. They are due (1) to *Bacillus melolonthæ nonliquefaciens β* and a gram-positive diplococcus (*Diplococcus melolonthæ*); (2) to *B. melolonthæ liquefaciens* and a gram-positive diplobacillus (*Diplobacillus melolonthæ*); and (3) to the same coccobacillus and a large sporulating bacillus, described as new under the name *Bacillus hoplosternus*, which takes Gram's stain poorly. *B. hoplosternus* is very pathogenic for the cockchafer and the caterpillar of *Vanessa urticæ*, but does not kill the caterpillar of the gipsy moth regularly even after many passages.

The coccobacilli of the cockchafer.—Their pathogenic action on some macrolepidopterous caterpillars, A. Paillot (*Compt. Rend. Soc. Biol. [Paris], 79 (1916), No. 20, pp. 1102, 1103; abs. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 3, p. 134*).—This relates to the investigations above noted.

New microbe parasites of the cockchafer.—Pathogenic action on the caterpillars of Vanessa urticæ and Lymantria dispar, and the silkworm,

A. PAILLOT (*Compt. Rend. Soc. Biol. [Paris], 80 (1917), No. 2, pp. 56–58*).—This reports upon further studies of the coccobacilli as above noted.

Coconut beetle in Samoa (*Trop. Agr. [Ceylon], 48 (1917), No. 4, pp. 219–225*).—This gives a report of a commission of inquiry concerning the coconut beetle (*Oryctes nasicornis*), appointed in July, 1916, by the administrator of Samoa.

The sugar cane wireworm in Fiji (Simodactylus cinnamoneus), R. VEITCH (*Colon. Sugar Refin. Co. [Fiji] Agr. Rpt. 1 (1916), pp. 18, pl. 1*).—A report of investigations of this pest in Fiji, where it is very destructive to sugar cane sets through eating the eyes, roots, and butts.

Canadian bark beetles.—I, Descriptions of new species, J. M. SWAINE (*Canada Dept. Agr., Ent. Branch Bul. 14 (1917), pp. 32*).—Thirty-nine species of Canadian bark beetles, here described as new, represent 14 genera of which two, namely, Pseudocryphalus and Pseudohylesinus, are new.

The strawberry weevil in Minnesota, Anthonomus signatus, S. MARCOVITCH (*Rpt. State Ent. Minn., 16 (1915–16), pp. 109–134, figs. 4*).—This report of investigations, commenced in 1914, is summarized by the author as follows:

"In Minnesota the adult weevils make their appearance the latter part of April or early in May, feeding on the underside of the leaves until the pollen is mature. The buds are first cut as soon as the first blossom shows and the fruit pedicels are about 2 in. high. Fields with from 40 to 95 per cent of the buds cut were not uncommon. The new brood emerges soon after picking, eating small holes on the underside of leaves. Hibernation began the latter part of August in 1915, among the dead leaves in the strawberry patch. The weevils pass the winter in the strawberry beds and not in the woods, at least in Minnesota. Old beds are more severely infested than younger ones. The natural enemies reared were five species of chalcids and one cecidomyid. The indications are that the weevils are not able to emerge when plowed under or covered with soil during cultivation.

"Since the weevils hibernate within the fields, the one-crop system will prevent severe injury. Badly infested fields should be plowed under immediately after the berries are picked. Where the two-crop system is practiced the beds should be burned over and thoroughly cultivated. Old, neglected patches should not be tolerated. The weevil will probably not be serious on the Everbearing strawberry. Covering the beds with muslin or spraying with poisonous arsenicals was not satisfactory."

A 4-page bibliography is included.

Alfalfa weevil quarantine conference, held at Salt Lake City, April 20 and 21, 1916 (*Bien. Rpt. State Hort. Com. Utah, 1915–16, pp. 127–158*).—A report of the conference, at which representatives from Montana, California, Colorado, Wyoming, Arizona, Idaho, and Utah were present.

Pineapple weevil in Above Rocks (*Jour. Jamaica Agr. Soc., 20 (1916), No. 9, pp. 361, 362; Hawaii. Forester and Agr., 14 (1917), No. 1, pp. 20, 21*).—This is a report of a second visit to the district where pineapples are badly attacked by a large black weevil (*Metamasius ritchiei*), accounts of which have been previously noted (E. S. R., 37, p. 162).

Pear blossom weevil (Anthonomus pedicularius) in Bessarabia, S. A. MOKRZHETSKIĬ (MOKRZECKI) (*Grushevyĭ Tsvi͡etoi͡ed (Anthonomus pedicularius) v Bessarabii. Kishenef: Salgir. Opytn. Plod. Sta., 1916, pp. 8, figs. 4; abs. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 4, p. 158*).—The larva of this weevil causes great damage to the pear in Bessarabia by devouring the lower part of both the flower and leaf buds.

Banana borer, F. WATTS (*Jour. Jamaica Agr. Soc., 21 (1917), No. 6, pp. 169–173*).—A memorandum of information on this weevil borer (*Cosmopolites sordida*). See also a previous note (E. S. R., 37, p. 161).

Sixteenth annual report of the Illinois State Beekeepers' Association, compiled by J. A. STONE (*Ann. Rpt. Ill. Bee-Keepers' Assoc., 16 (1916), pp. 170, pl. 1, figs. 20*).—This includes the proceedings of the twenty-sixth annual session of the Illinois State Beekeepers' Association, held at Springfield, Ill., in November, 1916, and of the nineteenth annual convention of the Chicago-Northwestern Beekeepers' Association, held at Chicago in December, 1916. A paper on Extension Work in Beekeeping, by E. F. Phillips (pp. 121–126), is included.

First lessons in beekeeping, C. P. DADANT (*Hamilton, Ill.: Amer. Bee Jour., 1917, pp. [12]+167, figs. 178*).—This is an entirely rewritten edition of a work published in 1911.

A thousand answers to beekeeping questions, C. C. MILLER, compiled by M. G. DADANT (*Hamilton, Ill.: Amer. Bee Jour., 1917, pp. 276, pl. 1, figs. 25*).—This is a compilation in alphabetical order of questions culled from many thousands answered by the author during a period of 22 years in the columns of the *American Bee Journal*.

Are bees responsible for most fire blight epidemics? A. C. BURRILL (*Idaho Honey Prod. Assoc. Ann. Conv., 6 (1917), pp. 29–67*).—This address, delivered at Twin Falls, Idaho, in January, 1917, deals with the history of bees and fire blight in the United States (pp. 31–33); number of visits per day or per flower *v.* number of days of pome bloom-percentage of honey-bees present (pp. 33–46); causes and cases of blight on blossomless trees (pp. 46–50); relations of insects other than bees to the spread of blight (pp. 50–59); and the control of blight (pp. 60, 61); relation of bees to its spread and control (pp. 61–63); and the bearing of these facts for Idaho and the future (pp. 63, 64). A bibliography of 62 titles is appended.

The hornet in Fiji (Polistes hebræus), R. VEITCH (*Colon. Sugar Refin. Co. [Fiji], Agr. Rpt. 2 (1917), pp. 16, pl. 1*).—This wasp, though generally considered an unmitigated nuisance, has been found to be beneficial in some districts, due to its predacious habits.

The turnip sawfly (Athalia flacca), R. W. JACK (*Rhodesia Agr. Jour., 14 (1917), No. 2, pp. 206–212, pls. 2*).—A summarized account of this pest, which is one of the most important enemies of cruciferous crops in Rhodesia.

Laboratory rearing of and temperature experiments with the egg parasites, Trichogramma semblidis and T. fasciatum, S. A. MOKRZHETSKIĬ (MOKRZECKI) (*O Laboratornom Razvedenīi IAītseīedov Trichogramma semblidis i T. fasciatum i Temperaturnye Opyty Nad Nimi. Simferopol: Salgir. Opytn. Plod. Sta., 1916, pp. 13, figs. 4; abs. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 4, pp. 155, 156*).—Experiments conducted indicate that it is practical to rear these parasites artificially in any numbers and to keep them for many months, though further experiments are required to demonstrate how far they can be utilized for the practical control of the codling moth.

Descriptions of thirty-one new species of Hymenoptera, S. A. ROHWER (*Proc. U. S. Nat. Mus., 53 (1917), pp. 151–176*).—Many of the 31 species here described as new, representing the superfamilies Tenthredinoidea, Ichneumonoidea, Serphoidea, Chalcidoidea, and Sphecoidea, are of economic importance as parasites of forest insects. Among these are *Pristaulacus strangaliæ*, a parasite of *Strangalia luteicornis* in *Carpinus caroliniana* at Charter Oak, Pa.; *Odontomerus strangaliæ*, parasitic on *S. luteicornis* breeding in grape at Ballston, Va.; *Pyracmon conocola*, parasitic on *Pinipestis* sp., living in the cones of *Pinus coulteri*, and probably a parasite of *Evetria taxifoliella* in cones of *Pseudotsuga taxifolia*, at Colestin, Oreg., and Julian, Cal.; *Angitia tineavora*, para-

sitic on tineid moths infesting the fruit body of *Polyporus dryophilus* at Mistletoe, Oreg.; *Meleborus laspeyresiæ*, parasitic on *Laspeyresia toruta* living in cones of *Pinus ponderosa* at Talent, Oreg.; *Phadroctonus argyresthiæ*, parasitic on a species of Argyresthia living on *Libocedrus decurrents* at Ashland, Oreg.; *Diospilus neoclyti*, a parasite of *Neoclytus capræ* breeding in *Quercus gambelli* collected in North Cheyenne Canon, Colorado; *Phanerotoma erythrocephala*, a parasite of *L. toruta* in the cones of *P. ponderosa* at Glenwood Springs, Colo.; and *Odontobracon œmeovorus*, parasitic on *Oeme rigida* at Apalachicola, Fla., and Morgan City, La.

Descriptions of some new parasitic Hymenoptera, A. B. Gahan (*Proc. U. S. Nat. Mus., 53 (1917), pp. 195–217*).—This paper contains descriptions of two genera, 25 species, and one variety new to science, of which each species is described from reared material, thus connecting it with a definite host record. The species thus described are *Ephedrus nitidus* from the cabbage aphis at New Brunswick, N. J.; *Microbracon sanninoideæ* from the peach borer at College Park, Md.; *Microgaster epagoges* from *Epagoge sulfureana* at Nashville, Tenn.; *Apanteles diacrisiæ* from *Diacrisia virginica*, Washington, D. C.; *Chelonus phthorimaeæ* from the potato tuber worm at Rocky Ford, Colo.; *Phanerotoma franklini* from the cranberry fruit worm at East Wareham, Mass.; *Opius pegomyiæ* from *Pegomyia vicina* at Oxnard, Cal.; *O. coriaceus* from *Ceradontha dorsalis* at Greenwood, Miss.; *O. otiosus* from *Agromyza parvicornis* at Brownsville, Tex.; *Neopius carinaticeps* n. g. and n. sp., reared from an Agromyza mine in Hordeum at Wimbledon, N. Dak.; *Rogas perplexus* from *Peridroma margaritosa* at Tempe, Ariz.; *R. politiceps* from *P. incivis* at Nashville, Tenn.; *R. rufocoxalis* from *Autographa brassicæ* and *P. margaritosa* at Rocky Ford, Colo.; *Nepiera benevola fuscifemora* from the potato tuber worm at Pasadena, Cal.; *Liodontomerus secundus* and *L. insuetus* from the clover seed chalcid fly at Caldwell, Idaho, and Tempe. Ariz., respectively; *Systellogaster ovivora* n. g. and n. sp., from *Blatta orientalis* at Urbana, Ill.; *Pteromalus hemileucæ* from *Hemileuca oliviæ* at Maxwell, N. Mex.; *Eupteromalus tachinæ* reared from the puparium of a tachinid parasite of *Leucania unipuncta*, probably *Archytes analis*, at Nashville, Tenn., and from *L. unipuncta* at Guelph, Canada; *Eutelus bruchophagi* reared from the clover seed chalcid fly at Nephi, Utah; *Chrysocharus mallochi* from *Agromyza felti* at Parker, Ill.; *Derostenus pallipes* from *Phytomyza aquilegiæ* at College Park, Md.; *Tetrastichus ainsliei* from *Mordellistena* sp., at Elk Point, S. Dak.; *T. dolosus* from *Euplectrus platyhypenæ* and *E. comstocki* at Tallulah, La.; *Notanisomorpha meromyzæ* from *Meromyza americana* at La Fayette, Ind.; and *Polymecus lasiopteræ* from *Lasioptera* sp., at Elk Point, S. Dak.

Infection tests of a fungus parasite of insects, Metarrhizium anisopliæ, A. A. L. Rutgers (*Dept. Landb., Nijv en Handel* [*Dutch East Indies*], *Meded. Lab. Plantenziekten, No. 25 (1916), pp. 9*).—The details of infection experiments with the green muscardine fungus on the larvæ of *Leucopholis rorida* and *Cyrtacanthacris nigricornis* are reported, largely in tabular form.

FOODS—HUMAN NUTRITION.

Possibilities of food from fish, H. F. Taylor (*U. S. Dept. Com., Bur. Fisheries Econ. Circ. 30 (1917), pp. 4*).—A brief summary.

The carp: A valuable food resource (*U. S. Dept. Com., Bur. Fisheries Econ. Circ. 31 (1917), pp. 7, fig. 1*).—This includes data on the nutritive value of carp and recipes for its preparation.

Why and how to use salt and smoked fish.—Sixty-one ways of cooking them, H. F. Moore (*U. S. Dept. Com., Bur. Fisheries Econ. Circ. 29 (1917), pp. 8*).—A brief discussion and recipes.

The examination of canned salmon for bacteria and tin, L. D. Bushnell and C. A. A. Utt (*Jour. Indus. and Engin. Chem., 9 (1917), No. 7, pp. 678, 679*).—Forty-four samples from 26 concerns were examined and found to be sterile. Of the 20 samples analyzed for tin, all were found to contain less than 50 mg., which is well below the tolerance of 300 mg.

Nutrition investigations upon cottonseed meal, II, Anna E. Richardson and Helen S. Green (*Jour. Biol. Chem., 30 (1917), No. 2, pp. 243–258, figs. 13*).—A continuation of work upon cottonseed meal as a food for human consumption (E. S. R., 35, p. 469).

It was found that with 50 per cent of cottonseed meal in the diet albino rats lived for from 400 to 565 days. With the addition of protein-free milk and milk fat the ration was sufficient for normal growth and reproduction to the third generation. This did not result with a 50 per cent cottonseed flour with a lack of protein-free milk and milk fat. In the former case, while there was no better growth, reproduction was increased and mortality lowered by the addition of 5 per cent of casein. When additional mineral matter was supplied, conditions in the second generation seemed still better.

No toxic effect was apparent from 45 to 50 per cent of cottonseed flour in the ration through four generations or during 565 days of the life of an individual. Petroleum ether extract of cotton seed in a well-balanced ration had a depressing effect on weight. Ethyl ether extract from petroleum-ether-extracted cotton seed and ethyl ether extract from Allison cottonseed flour showed no harmful effects.

The possibility of typhoid infection through vegetables, C. O. Melick (*Jour. Infect. Diseases, 21 (1917), No. 1, pp. 28–38*).—It was found that the longevity of *Bacillus typhosus* depends on the strain and the soil, varying from 29 to 58 days. Under natural conditions radishes grown in contaminated soil were infected after periods of 28, 35, and 37 days, and lettuce after 21 days. No evidence was found that the organisms entered the interior of the plants, but organisms attached to the surfaces were not removed by ordinary washing.

Fresh fruits and vegetables as conservers of other staple foods, Caroline L. Hunt (*U. S. Dept. Agr., Farmers' Bul. 871 (1917), pp. 11*).—The place of fruits and vegetables in the diet in general is discussed, and specific directions given for the use of green peas and beans in place of meat, potatoes in place of cereals, and fruit to save sugar. A model menu and various recipes are included.

Microscopical studies on tomato products, B. J. Howard and C. H. Stephenson (*U. S. Dept. Agr. Bul. 581 (1917), pp. 24, figs. 5*).—Microanalyses of a considerable number of tomato products indicated that such products when made from stock judged acceptable by visual inspection, do not show high counts of microorganisms. High counts indicate that the stock was in bad condition or handled in an insanitary manner. Pulp stored in barrels gave high counts.

The field work done indicates that stock should not contain over 1 per cent of decayed material and have a spore count of less than 20. A bacterial count of 15,000.000 indicates little as to the amount of decay, but beyond this point up to 20 per cent of rot each 20,000,000 means an increase of about 1 per cent of rot. High counts in tomato pastes and sauces indicate bad stock or insanitary handling.

The method used for the microanalysis of tomato products is included.

Maine packed blueberries, corn, and sardines, C. D. Woods and A. M. G. Soule (*Maine Sta. Off. Insp., 83 (1917), pp. 37–52*).—This includes, among other data, tables giving the amount of water in different brands of canned blueberries and corn and the condition of canned sardines.

Food plants and textiles of ancient America, W. E. SAFFORD (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 1, pp. 146–159, pl. 1, figs. 4*).—The paper gives an account of the principal food and textile plants of the Americas and their use by the prehistoric inhabitants. It includes, among other plants, maize, beans, peanuts and other legumes, squashes, pumpkins, various roots and tubers, coca, chocolate, tea, and cotton.

[Food and its conservation in North Dakota], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 4 [1917], No. 15, pp. 379–394*).—This number contains analyses of various food and drug products together with a discussion of war bread and various other food conservation topics.

Ten lessons on food conservation (*Washington: U. S. Food Admin., 1917, pp. 64*).—There is included, along with suggestions on conservation, a lesson on the fundamentals of an adequate diet and the practical application of the facts of nutrition.

The eat-less-meat book.—(War ration housekeeping), MRS. C. S. PEEL (*London and New York: John Lane Co., 1917, pp. 207*).—War ration housekeeping in England is discussed, including a popular summary of food values and menus. A large part of the book is taken up with recipes using little meat.

Bibliography of school lunches, compiled by LUCY CONDELL (*U. S. Bur. Ed. Circ., 1917, pp. 25*).—Some 150 titles are included.

The effect on human milk production of diets containing various forms and quantities of protein, B. R. HOOBLER (*Amer. Jour. Diseases Children, 14 (1917), No. 2, pp. 105–112*).—The author concludes that a nutritive ratio of 1 part digestible protein to 6 parts digestible fat and carbohydrate seems best adapted to the needs of nursing mothers. Animal protein is deemed more suitable than vegetable protein in supplying nitrogen and maintaining the nitrogen balance. The protein from nuts, when fed with other vegetable protein, is also adequate.

"A diet composed exclusively of cereals, fruits, and vegetables does not supply sufficient protein for elaborating milk protein and causes a severe drain on the tissues of mother.

"Of the various forms of animal protein, that which is derived from cow's milk seems particularly suitable for the production of human milk protein, as well as for the preservation of maternal tissues."

The effect of the emotions on the catalase content of the liver, W. E. and E. L. BURGE (*Amer. Jour. Physiol., 44 (1917), No. 1, pp. 75–79*).—Experimental work on cats and dogs gives evidence that the fighting emotions and probably exercise increase greatly the catalase content of the liver. This catalase is given off to the blood and carried to the tissues, presumably to cause increased oxidation.

ANIMAL PRODUCTION.

Palm-kernel cake, C. CROWTHER (*Jour. Bd. Agr. [London], 23 (1916), No. 8, pp. 734–749*).—Studies by the University of Leeds are reported.

On the question of palatability, reported by H. J. Hargraves, there was varying difficulty at first to get cattle to eat palm-nut meal or cake, and a uniform difficulty with sheep. This was not found to be due to flavor or aroma, as usually believed, but to a grittiness present. Soaking or straining did not overcome the difficulty, but mixing with other feeds, as linseed cake, overcame the trouble in proportion to the admixture. The difficulty is deemed of no practical significance where the palm-kernel cake does not form over one-third or one-half of the total mixture.

Keeping qualities, reported by W. Godden, showed that in the laboratory and on the farm the palm-kernel cake compared favorably with six other

cakes. It showed no sign of deterioration not equally marked with the other cakes, except linseed cake and, possibly, soy cake.

Data on the digestibility of palm-kernel cake and extracted palm-kernel meal and undecorticated cottonseed cake are reported by H. E. Woodman, as obtained with two sheep. The differences of digestibility between the palm-kernel cake and meal were slight, but the palm-kernel meal may be regarded as worth 23 per cent more and the palm-kernel cake 35 per cent more than cottonseed cake.

In a study of the influence of palm-kernel cake upon the yield and composition of milk, reported by A. G. Ruston, five cows were fed on pasture. The results were variable. There was a gain in live weight of the animals while on cake, a favorable influence upon the production of milk fat, and a slight increase in the fat content of the milk.

In a report of the influence upon the composition of the milk fat, made by H. Woodhouse, the results of analyses are shown indicating the passage of some ingredient of the palm-kernel oil into the milk fat. This renders probable the conclusion that the effects upon the output can be attributed thereto.

Feeding stuffs of minor importance, F. W. Woll (*California Sta. Circ. 167* (*1917*), *pp. 7*).—The object of this circular is to describe briefly some materials which, while not generally used, may be employed as feeding stuffs, because of the scarcity and high prices prevailing for hay and other common feeding stuffs. The following are discussed: Cereal straw, rice straw, legume straw, foxtail, Indian-corn stalks, stalks of grain sorghums, cannery refuse, sugar-beet tops and leaves, cull potatoes, potato tops, orchard products, acorns, and spineless cactus.

Utilization of farm wastes in feeding live stock, S. H. Ray (*U. S. Dept. Agr., Farmers' Bul. 873* (*1917*), *pp. 12*).—The need of a more efficient use of straw, corn stover, and cottonseed meal is pointed out, and rations containing these products are listed for cattle, sheep, and horses.

Animal industry: The problems confronting it during and after the war, C. Pucci (*Bol. Quind. Soc. Agr. Ital., 22* (*1917*), *No. 7–8, pp. 172–182*).—A paper and discussion relating to the industry in Italy. A better utilization of fodders, by-products, etc., is advocated, and closer organization of those engaged in live-stock production is urged as a means of bettering present conditions and solving the problems that will arise after the war.

The sheep industry on the Minidoka reclamation project, E. F. Rinehart (*U. S. Dept. Agr. Bul. 573* (*1917*), *pp. 28, figs. 7*).—This report treats briefly of the agricultural conditions on this reclamation project and in detail of the history and present status of the sheep industry, methods of sheep management, and the future development of the industry. The suggestions made in this bulletin, while based primarily on the results of observations on the Minidoka reclamation project, are deemed applicable to several other irrigation projects in the northwestern United States having similar climatic and agricultural conditions.

Ration experiments with swine, A. D. Faville (*Wyoming Sta. Bul. 114* (*1917*), *pp. 8*).—Fifteen pigs averaging 87 lbs. each were divided into three lots and fed as follows: Lot 1, ground barley; lot 2, ground barley and meat meal 9:1; and lot 3, ground rye. The grains were valued at $25 per ton, the meat meal at $55. The pigs were bought at $7 per hundredweight and sold for $9.40. They were fed in the experiment for 70 days.

Lot 1 made an average daily gain of 1.46 lbs., requiring 4.13 lbs. of feed per pound of gain and costing 5.16 cts. Lot 2 gained 1.74 lbs. daily with 3.33 lbs. feed per pound of gain, costing 5.18 cts. Lot 3 gained 1.53 lbs. daily with 3.48 lbs. feed per pound of gain, costing 4.35 cts.

During the first six weeks the grains were mixed with water and fed immediately, while for the last four weeks they were soaked from one feeding to another. The soaking apparently increased the grain consumed and the gains made, but without materially changing the amount of feed per pound of gain.

An analysis of the grains, which were grown locally, is appended.

[Pasturing alfalfa, corn, and rape with hogs], D. HANSEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Huntley Expt. Farm, 1916, pp. 10, 11, fig. 1*).—A continuation of work previously reported (E. S. R., 36, p. 171) on a six-year rotation in which third-year alfalfa and corn were harvested by pigs. One lot of five pigs with an initial weight equivalent to 2,096 lbs. per acre, was pastured from May 1 to July 15, 1916, and a second lot of eight pigs with a weight equivalent to 1,424 lbs. per acre was pastured from July 15 to September 23, 1916. In addition the pigs were fed 2 lbs. of corn per day per 100 lbs. of live weight.

During the two periods 758 lbs. of pork was produced. The corn consumed during the season amounted to 1,750 lbs. and the return from the alfalfa crop to $124.72 per acre.

Four of the pigs used in the second period of the alfalfa-pasturing experiment were transferred to a corn plat September 23. In 20 days they gained 168 lbs., with a net return of $47.04 per acre for the corn.

On two corn plats rape was sown between the rows on August 1, but made little growth. Four pigs were put on these plats September 23, and in 38 days they had cleaned up the plats. Gains were made at the rate of 586 lbs. per acre, and returned 81 cts. per bushel for the corn.

Swine management, G. M. ROMMEL and F. G. ASHBROOK (*U. S. Dept. Agr., Farmers' Bul. 874 (1917), pp. 38, figs. 16*).—This is a revision of Farmers' Bulletin 205 (E. S. R., 16, p. 400). The industry is treated under the following heads: The merits of the hog, hog-growing sections of the United States, location of farm for hog raising, number of hogs for a farm, the foundation herd, feeding and management, sanitation in the hog lot, prevention of disease, treatment of disease, destruction of vermin, and intestinal worms.

The present position and future prospects of swine breeding in Denmark, P. A. MÖRKEBERG (*Tidsskr. Landökonomi, 1916, Nos. 5, pp. 233–269; 6, pp. 324–336; Dept. Agr. and Tech. Instr. Ireland Jour., 17 (1916), No. 1, pp. 40–56*).—This article, based upon a lecture delivered before the Royal Danish Agricultural Society, describes the history, development, and future prospects of swine breeding in Denmark.

The plan of organization and operation of breeding centers is explained, and the method of testing the offspring of the stud animals in the breeding centers is outlined. An average of two pigs from each selected sow is sent annually to the experiment stations. From the performance of these pigs data are obtained as to age at which killing weight is reached, feed units required to produce a given weight, and quality of the bacon. The results are made the basis of selection of stud animals, those being preferred whose descendants have shown the highest degree of thriftiness and growth energy, and have produced the best bacon.

It is stated that this plan has been most valuable in improving both the Danish and Yorkshire breeds of swine, the two bacon breeds of Denmark.

Feeding horses, C. N. ARNETT (*Montana Sta. Circ. 65 (1917), pp. 73–82*).—A discussion of feeds and the feeding of horses, with special reference to Montana conditions.

Artificial insemination, E. H. RILEY (*Montana Sta. Circ. 63 (1917), pp. 57–66, figs. 7*).—General directions are given for the artificial impregnation of mares.

On the life duration of the horse spermatozoon outside of the body, S. Satô (*Acta Scholae Med. Univ. Imp. Kioto, 1 (1916), No. 3, pp. 361–374; abs. in Jour. Roy. Micros. Soc., No. 4 (1917), p. 381*).—The author has observed the duration of life of horse spermatozoa in 1.1 NaCl solution (up to 10 hours, rarely 24), and in from 5.2 to 5.25 per cent dextrose solution (from 10 to 30 hours, rarely 70). Suitable conditions are an alkalinity corresponding to 0.001 per cent KOH, an osmotic pressure equal to 5.24 per cent dextrose, a temperature of from 13 to 15° C., one atmospheric pressure, and a percentage of oxygen much less than that in air.

The numerical law of the regression of erectile organs, following castration of adult Gallinaceæ, A. Pézard (*Compt. Rend. Acad. Sci. [Paris], 164 (1917), No. 19, pp. 734–736, figs. 4*).—In a study of the effect of postpuberal castration on the regression of erectile organs (combs, wattles, and ear lobes) in cocks, the author has measured the diminution of length of comb following castration of four birds. Three of these were completely castrated and the fourth was a capon in which the development of the comb was obtained by the injection of testicular extract and the regression of the organ was produced by the cessation of the injections. It was found that the testicular hormone is necessary for the development and maintenance of erectile tissue. Furthermore, the action of this hormone must be constant.

Gonadectomy in relation to the secondary sexual characters of some domestic birds, H. D. Goodale (*Carnegie Inst. Washington Pub. 243 (1916), pp. 52, pls. 7, fig. 1; abs. in Jour. Roy. Micros. Soc., No. 1 (1917), pp. 106, 107*).—Experiments were conducted with Rouen ducks, Brown Leghorn fowls, and cross-bred birds, observing the changes in plumage, etc., that follow gonadectomy.

The plumage of the orchidotomized male was altered comparatively little. Some feathers grew somewhat longer, but otherwise they were the same as in the unaltered male. In contrast, the plumage changes of the ovariotomized female were extensive, in respect to shape, size, color, and color pattern. The plumage approximated that of the normal male.

The capon's comb and wattles remained of infantile type. In the castrated hens the comb became very large and malelike in some, while in others it remained comparatively small.

All the capons reported on had well-developed spurs. In all the castrated hens in which the male plumage also developed there were well-developed spurs, while in many of those in which the assumption of male plumage was partial or temporary the spurs started to grow. Apparently the dependence of the spurs upon the internal secretion is relatively slight. The inhibition exerted in the female upon the development of the spurs is so slight that once development starts the hormone is not always able to check it.

In the cases reported on, castration with one exception, has not influenced the molt of the capon. On the other hand, castrated ducks lose the power of developing the summer plumage. Castration is without influence on the color of the male duck's mandible, but ovariotomy results in the disappearance of certain pigments from the mandible of the female. Completely castrated individuals of all kinds are on the whole negative in behavior as compared with normal adults.

Male characters, such as spurs, large comb and wattles, and a " neck ring " in ducks, sometimes occur in otherwise normal females. Instances of the occurrence of female characters in males, strictly comparable to those just referred to, are uncommon or wholly lacking. The only character of this sort among capons is the brooding instinct. Some femalelike characters in males are juvenile characters. Neither the assumption of male plumage by the female nor the development of the accessory reproductive organs need be considered evi-

dence that the female is a suppressed hermaphrodite, because the secretion of the ovary clearly controls their development. On the other hand, it is clearly proved that the female is a suppressed pseudohermaphrodite. On the whole, the relation between the gonads and the secondary sex characters appears to be specific and not general.

The three most important results are as follows: (1) If the ovary of a domestic bird be removed completely, many of the secondary sex characters of the male appear (and always of the male of the same race). Some individuals become nearly complete replicas of the male, others imperfect imitations of the male. (2) If the testes be removed, the majority of the secondary sex characters of the male develop, though a few may remain in an infantile condition. (3) Castrated drakes lose the power of developing the summer plumage.

Contribution to the history of the development of the exterior attributes of the male sex in female birds, O. Larcher (*Rec. Méd. Vét., 91 (1916), No. 11–12, pp. 173–183*).—This is a historical summary of the literature pertaining to this subject, including an extensive bibliography.

Some observations on the origin of melanin pigment in feather germs from the Plymouth Rock and Brown Leghorn fowls, R. M. Strong and Katherine Knowlton (*Anat. Rec., 13 (1917), No. 2, pp. 97–108, figs. 6*).—A study was made of the melanin pigment in feather germs pulled from the back, breast, neck, and wings of adult Plymouth Rock and Brown Leghorn male and female fowls.

Examination of sections cut from these feather germs showed that melanin pigment granules occur occasionally in the so-called cylinder and inner-sheath cells. Further evidence was obtained that the melanin pigment of feathers is epidermal in origin. Melanophores were found in the dermal pulp at the proximal end of feather germs. Some of t' ese pulp melanophores have processes which are usually relatively short, but they do not appear to distribute pigment to other cells, and they have no part in the histogenesis of the feather or its pigment.

Inter-periodic correlation in the egg production of the domestic fowl, J. A. Harris, A. F. Blakeslee, and W. F. Kirkpatrick (*Proc. Nat. Acad. Sci., 3 (1917), No. 9, pp. 565–569, figs. 2*).—This investigation deals with the correlations between the egg production of various periods in White Leghorn fowls.

The coefficients of correlation between the production of single months and the production of the remaining 11 months of the year range, in the cases observed, from 0.295 to 0.567 in the several months (November–October) of 1913–14 and from 0.24 to 0.567 in 1914–15. For purposes of prediction the correlation coefficients may be thrown into the form of linear regression equations, which have been found to give reasonably good fits to the empirical means for the annual egg records of birds laying various numbers of eggs in the individual months. The slope of the lines when plotted shows there is an increase of from 2.6 to 5 eggs in mean annual production associated with a variation of one egg in monthly record. Since in practical selection groups of birds differing by far more than a single egg may be recognized, the difference in annual production secured by selecting in any month may be of very practical importance, amounting to from 30 to 60 eggs per year.

Coefficients are also given showing the correlation between the annual total and the deviation of the monthly record from the value which it should have if variation in monthly production were directly proportional to variation in the annual production. Sets of correlations, 110 coefficients in all, have been worked out for the production of five of the individual months and the production of each of the other months of the contest year (November–October).

The months selected were November of the pullet year and the following October and the intervening months, January, April, and August. These 110 coefficients are without exception positive in sign. This indicates that if abnormally high laying at one period tends, as the result of nutritional or other physiological factors, to result in abnormally low production during a subsequent period, the reduction is not sufficient to outweigh the influence of the initial differentiation of the birds in their capacity for egg production suggested above.

Two laws are evident in these intermensual correlations: (1) The correlation between the egg production of the individual months tends to become smaller as the records upon which the correlations are based become more widely separated in time. (2) There is a more intimate correlation between the egg production of the autumn and winter months at the beginning and end of the contest year than between the egg production of these months and the productions of the intervening spring and summer months.

The cycles and rhythm of egg production, C. T. PATTERSON (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 3 (1916), Nos. 2, p. 16; 3, p. 20*).—A discussion of the cycles and rhythm of egg production as a basis for selection of high egg producers. The term cycle is used by the author to mean the number of eggs the hen lays without missing a day. The rhythm of egg production means the recurrence of the cycle. In selection experiments with several hundred hens, in connection with the egg-laying competition at the Missouri Poultry Station, those having a cycle of 4 eggs or more during March averaged 156 eggs in the year, and all which had a cycle of 2 eggs or less averaged 110 eggs each.

The hen's annual vacation, G. M. ROMMEL (*Jour. Heredity, 8 (1917), No. 3, pp. 132–142, figs. 11*).—The author discusses the natural causes of a scarcity of eggs in winter and suggests simple rules for increasing fall and winter egg production. Briefly these are (1) hatch chickens early—between March 1 and April 30, (2) develop the pullets properly, and (3) furnish good quarters for the following winter. Feed liberally when laying begins.

Fourth Irish egg-laying competition (*Dept. Agr. and Tech. Instr. Ireland Jour., 17 (1916), No. 1, pp. 88–109*).—A detailed account is given of the fourth Irish egg-laying contest held at the Munster Institute, Cork, from October 1, 1915, to August 31, 1916.

Fourth Irish egg-laying competition, 1915–16.—Supplementary report on the noncompeting pens, with some notes on the breeding of Rhode Island Reds for egg production, MISS L. MURPHY (*Dept. Agr. and Tech. Instr. Ireland Jour., 17 (1917), No. 2, pp. 280–289*).—A report is given of the performance of the noncompeting pens in the egg-laying contest noted above, together with some notes on the breeding of Rhode Island Reds for egg production.

The breeding experiment was started in 1909 with 10 Rhode Island Red pullets which were mated to a male bird hatched from eggs imported from America. The average egg production of the 10 birds during their pullet year was 129 eggs. In 1911, 10 of the best pullets that had been raised from the above mating were mated to a male bird that was selected on the factor of vigor. These 10 pullets averaged 139 eggs each in their pullet year. One of the pullets laid over 200 eggs and made a high winter record. Her eggs were large, thick in shell, and of good color. From this hen and the above male 8 pullets were reared in 1912. These 8 pullets averaged 214.5 eggs each during their pullet year. From a half sister of the above hen mated with the same male 8 pullets were raised that averaged 221 eggs each for 12 months. These birds have become the foundation of a valuable line.

In breeding for increased size of egg it was found that whenever a hen laying a first grade egg (2 oz. and upwards) was mated to a male bird, the

son of a similar hen, the pullet offspring invariably laid eggs of first grade. Small eggs were not always coupled with heavy production.

In grading up flocks at the Munster Institute all birds have been weeded out that failed to lay 30 eggs during the three winter months, and the best pens are made up of hens that have a winter egg record of 40 eggs. To learn the effect of mating the son of a good layer to a pen of birds with poor egg records a cockerel from a 200-egg hen was mated to 6 hens with an average record of 95 eggs for 11 months. Twelve pullets saved from this mating averaged 127 eggs each for 11 months. It is stated that for the specialist breeder accurate trapnest records and the most vigorous culling are essentials to success. "The number of eggs laid during the winter period, the size of egg, the substance of the shell, the suitability of the eggs for hatching, the ease with which chickens can be reared, and the rate of growth of young birds have all to be taken into consideration. If the hen fails seriously in any one of these points, she is unfit for the breeding pen no matter what her egg record may be."

Final report on egg-laying competition, Queensland Agricultural College, April, 1916, to March, 1917 (*Queensland Agr. Jour., n. ser., 7 (1917), No. 5, pp. 222–229*).—A detailed account is given of the thirteenth egg-laying competition at the Queensland Agricultural College.

In all, 438 birds were subjected to the year's test, 318 in groups of six, while 120 were tested individually. It is stated that group testing has to a great extent served its purpose, and that single-pen tests will be substituted for the group tests in the future as rapidly as funds become available for the reconstruction of yards and houses.

Origin of the sex cords and definitive spermatogonia in the male chick, C. H. SWIFT (*Amer. Jour. Anat., 20 (1916), No. 3, pp. 375–410, figs. 6; abs. in Jour. Roy. Micros. Soc., No. 1 (1917), p. 109*).—The true sex cords or seminiferous cords originate from the germinal epithelium during the sixth and seventh days of development, and are the result of localized activity of the epithelium. Nearly all the primordial germ cells present in the germinal epithelium are carried down into the seminiferous cords, but they play only a passive rôle, for at this time they show no evidences of cell division. The sex cords remain attached to the germinal epithelium for only a short time, and continue to grow, after formation of the albuginea, as a result of division of the peritoneal cells. At the end of the seventh day of development the sex of the individual can be easily told, for in the male the gonads are of nearly equal size, while in the female the left gonad is much the larger.

Cavities begin to appear in the network of seminiferous cords during the twentieth day, arising by liquefaction of axial cells. At this date the spermatogonia are found against the basement membrane, with the nucleus toward the central axis of the cord, and the mitochondrial crescent near the basement membrane. They probably reach this position by amœboid migration. The elongated cells between the spermatogonia are derived from the peritoneal cells of the seminiferous cords. The primordial germ cells give rise to the spermatogonia, and the cœlomic cells of the germinal epithelium produce the supporting cells of the seminiferous tubule.

New Jersey poultry survey, A. G. WALLER (*New Jersey Stas., Hints to Poultrymen, 6 (1917), No. 1, pp. 4*).—Data as to receipts and expenses on 150 poultry farms in Vineland, Lakewood, and Sussex Counties for the year ended November 1, 1916, are reported. The average number of birds was 737 and the labor income $730.

Poultry keeping in town and country, F. C. ELFORD (*Canada Dept. Agr., Poultry Div. Bul. 89 (1917), pp. 47, figs. 66*).—This is a treatise on the industry in a general way, written in popular style for general distribution. The various

phases of poultry rearing are treated with a view of teaching better methods and of arousing and stimulating interest in the industry.

The guinea fowl, A. S. WEIANT (*U. S. Dept. Agr., Farmers' Bul. 858* (*1917*), *pp. 15, figs. 5*).—Practical instructions in breeding, feeding, and marketing the guinea fowl.

The progress of ostrich raising in Morocco, AUBRY (*Rec. Méd. Vét., 92* (*1916*), *No. 21, pp. 622–634, figs. 9*).—Trials at Mekinez which give promise of success are reported. Artificial incubation is found preferable to natural.

The rabbit industry, L. BRECHEMIN (*L'Élevage Moderne et L'Industrie du Lapin. Paris: Libr. Agr. Maison Rustique,* [*1916*], *pp.* [*4*]+*188, figs. 42*).—Data are given on origin, breeds and breeding, diseases, and the manufacture of the skins.

DAIRY FARMING—DAIRYING.

Trials with California silage crops for dairy cows, F. W. WOLL and E. C. VOORHIES (*California Sta. Bul. 282* (*1917*), *pp. 19–40*).—Experiments with silage crops conducted at the university farm during the past four years have shown that average yields of from 10 to 15 tons of green forage may be secured on grain land receiving one irrigation, in the case of corn, sweet sorghum, milo maize, feterita, and Sudan grass. When cut at the right time (about time of maturity for corn, and when fully matured for the other crops) and carefully packed in the silo, all these crops produce silage of excellent quality and palatability and furnish succulent feed of special value for feeding dairy and beef cattle, as well as sheep, during late summer or the winter season.

In a feeding experiment comparing alfalfa hay as a sole roughage with alfalfa hay and corn silage for milch cows, two lots of 13 cows each were fed for three periods of 4 weeks each. Lot 1 was fed alfalfa hay and corn silage throughout the test and lot 2 alfalfa and corn silage during the first and third periods and alfalfa hay as a sole roughage during the second period. In addition, 8 of the cows in each lot were fed a grain mixture of approximately equal parts by weight of wheat bran, rolled barley, and oats, and small amounts of linseed meal and coconut meal. The other cows received only the rough feeds. The production of lot 2 showed an average increase of 2.7 lbs. milk and 0.1 lb. milk fat per head daily on alfalfa hay and silage as compared with alfalfa hay as a sole roughage. For both the lots it is estimated that the milk and butter production was increased 14 per cent by the use of silage. Comparing the production of the 10 cows in this test which were fed alfalfa hay alone with that of the 16 cows fed alfalfa hay and grain, it is noted that where the cows were fed grain there was an increase of from 1 to 3 per cent in milk and milk components when silage was fed. On the other hand, the cows fed no grain showed an increase of from 26 to 27 per cent in milk and butter production due to the feeding of silage. The nutritive ratio for the rations fed lot 2 was 1:5.8 during the silage periods and 1:3.9 during the no-silage period. Apparently the efficiency of the rations was from 11 to 12 per cent greater during the silage periods than during the no-silage period.

In order to test the value of milo maize silage as a supplement to alfalfa hay 18 cows were fed during three periods of 4 weeks each as follows: First and third periods, milo maize and alfalfa hay; second period, alfalfa hay. In addition 10 of the cows were fed from 3 to 6 lbs. per head daily of a mixture of rolled barley, coconut meal, and dried beet pulp (1:2:1). The average milk yield was slightly lower on the silage rations than on the dry feed only, but the quality of the milk produced on the former rations was somewhat better than that on the latter, making the average production of fat and other milk

solids practically the same for the two kinds of rations. The milk and fat production per 100 lbs. of dry matter in the rations was from 5 to 8 per cent higher on the silage rations than on the dry roughage ration.

Experiments were also conducted to furnish information regarding the comparative value for milk production of corn silage and silage made from Sudan grass or sweet sorghum. In comparing Sudan grass silage and corn silage 21 cows were fed three periods of 4 weeks each on alfalfa hay and a grain mixture of dried beet pulp, coconut meal, wheat bran, and rolled barley (4:1:1:1), and in addition corn silage during the first and third periods and Sudan grass silage during the second period. During the corn-silage periods there was slightly larger production than during the Sudan grass silage period. On the basis of dry matter content of the rations the corn silage rations were about 10 per cent more efficient than the Sudan grass silage.

In a further test 28 cows were fed as in the above experiment except that sweet sorghum silage was fed instead of Sudan grass silage. In this test all but 3 cows received concentrates in addition to alfalfa hay and silage. Only insignificant differences in the effect of the two silage rations on the production of the cows were found. When compared on the basis of dry matter content the sweet sorghum silage rations were about 5 per cent more efficient than the corn silage rations.

Results of analyses of the feeds used in these tests are tabulated.

[Tests of irrigated pastures], D. HANSEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Huntley Expt. Farm, 1916, pp. 14–16, fig. 1*).—A test of the carrying capacity of pastures, previously reported (E. S. R., 36, p. 173), was continued. Two grade Jersey cows were pastured from May 8 to October 1, 1916, or 146 days, on a pasture of mixed grasses, supplemented at times with alfalfa hay. During the period the cows produced 145 lbs. of milk fat, and gave a net return of $49.76 per acre for the pasture.

In a preference test of individual grasses, several plats of grasses were thrown into one inclosure and pastured by a cow. She showed a decided preference for white clover and brome grass. After grazing these plats rather closely preference was shown for the remainder of the grasses in the following order: Meadow fescue, orchard grass, tall fescue, and perennial rye grass.

Notes on pasturing a heifer and sheep are included.

Report of progress on animal husbandry investigations in 1916, R. PEARL (*Maine Sta. Bul. 261 (1917), pp. 121–144*).—Progress reports are made on the following lines of work:

Cooperative breeding records.—For the purpose of this study about 200 of the leading breeders of cattle in Maine, and a few outside of the State, are contributing exact records of the breeding operations in their herds. From data thus furnished and here tabulated, including 3,085 cows and heifers and 217 bulls in 192 herds, it appears that the great majority of this group of breeders attempt to follow some definite rule in regard to the time of the heat period at which the cow shall be served, ostensibly for the purpose of control of the sex of the offspring. About 42 per cent of these breeders think that early service is most likely to get heifer calves, while about 27 per cent think that service late in heat and 3.1 per cent think that when cows are bred in the middle of heat this end is obtained. An examination of the actual times of breeding, however, shows that these 192 breeders are having more of their cows served in the mid-oestral period than either very early or very late.

Physiology of reproduction.—It is noted that the station will soon issue a bulletin on this subject, with special reference to the breeding of dairy cattle.

The control of the sex ratio.—From a study of statistics which it is stated are soon to be published, it appears that there is no definite or permanent rela-

tion between the time in the heat period at which the cow is served and the sex of the offspring. Tabulated results of 1,313 matings show that of the calves resulting from service under three hours after appearance of heat 51 per cent were bulls, of calves resulting from service over three hours and under eight hours 51.7 per cent were bulls, and 46.9 per cent of the calves were bulls when the cows were served over eight hours after the appearance of oestrum.

The analysis of milk records.—In continuation of this study (E. S. R., 37, p. 775), the effect of certain Advanced Registry Jersey bulls on the average milk, fat test, and net milk-fat production of their daughters as compared with the dams of these daughters is considered. From tabulated data of 23 well-known Jersey sires, it appears that about one-half of the bulls in this group got daughters which, on the average, were poorer producers than the dams of those daughters. In some cases the deleterious effect of the bull on the productive qualities of his offspring was extremely marked. On the other hand, certain of the bulls in this group exercised an extraordinarily beneficial effect upon the productive qualities of the breed.

New cooperative project.—An outline is given of a cooperative plan by which it is hoped to furnish to the dairy cattle breeders of the State definite and dependable information as to whether their bulls are transmitting productive qualities to their progeny.

Breeding experiments.—Notes are given on the progress being made in the attempt to build up an experimental herd of crosses between low-milking and high-milking breeds, and between low-testing and high-testing breeds of cattle.

Report of the second Jersey sires' futurity test of the Aroostook Jersey Breeders' Association.—A report is given of the second of these sires' futurity tests (E. S. R., 35, p. 70), which was held at the Aroostook farm in October, 1916.

The change of milk flow with age as determined from seven day records of Jersey cows, R. Pearl and S. W. Patterson (*Maine Sta. Bul. 262 (1917), pp. 145–152, fig. 1*).—Results are given of a study of the milk flow of Jersey cows as affected by age. The basis of the study was the seven-day milk records of 5,821 Jersey cows as published by the American Jersey Cattle Club.[1]

It is concluded that milk production changes with age in a definite manner. This change follows a logarithmic curve of the form $y=a+bx^2+c \log x$ where y=production and x=age. Maximum production is reached at approximately the age of eight years and seven months.

The dairy record (*Minnesota Sta., Rpt. Grand Rapids Substa., 1916, pp. 60–64, fig. 1*).—A progress report is given of an experiment in breeding up a herd of grade Guernseys from common and mixed-blood cows with pure-bred Guernsey bulls. In 1905, when the project was begun, the average milk fat production per cow was 196 lbs. In 1916 this production had increased to 300.7 lbs. The average milk production per cow of 41 cows in the herd in 1916 was 6,281 lbs. The average fat content of the milk increased from 4.27 per cent in 1911 to 4.78 per cent in 1916. Summarized herd records from 1911 to 1916, inclusive, and individual records for 1916 are tabulated.

Data on stump-land pasture emphasize the advisability of brushing and seeding down stump lands, as the net profit per acre from stump lands after being seeded down to grass for several years will almost equal the original cost of brushing and seeding, when grazed by dairy cows.

Raising dairy heifers (*Mo. Bul. Ohio Sta., 2 (1917), No. 9, pp. 291–298, figs. 2*).—On the basis of previously noted studies in Wisconsin, Connecticut, Massa-

[1] Jersey Sires and Their Tested Daughters. Published by American Jersey Cattle Club, New York, 1909.

chusetts, and Ohio, and on data obtained on twelve Ohio farms, the attempt is made to estimate the cost of raising dairy heifers under present conditions. Tabulated data show the cost of raising heifers under various price schedules for feeds, etc. These data indicate that with the present prices of feed and labor it costs over $100 to raise a heifer to two years of age.

The milch goat in California, E. C. Voorhies (*California Sta. Bul. 285 (1917), pp. 87–114, figs. 13*).—In addition to general information on the breeds of milch goats represented in California, composition and uses of goat's milk, immunity of goats to diseases, care and management of goats, and future prospects of the milch goat industry in the State, results are reported of experimental work with milch goats at the station, in part previously noted (E. S. R., 36, p. 173), but with data for three additional animals. The average feed cost for five does has been 6.4 cts. per gallon of milk as compared with 8.3 cts. for 73 cows.

The cost of distributing milk in six cities and towns of Massachusetts, A. E. Cance and R. H. Ferguson (*Massachusetts Sta. Bul. 173 (1917), pp. 54, pls. 5, figs. 4*).—This investigation covers the cost of distributing milk in Amherst, Walpole, Haverhill, Pittsfield, Springfield, and Worcester. The work was done during the fall of 1914 and winter of 1915 by the Massachusetts Agricultural College in cooperation with the Bureau of Markets of the U. S. Department of Agriculture. Accounts and statements were obtained from 85 distributors, some of whom were producers and some dealers. Including labor, depreciation, maintenance, and overhead charges, it cost these distributors an average of 2.64 cts. per quart to distribute retail milk during the period under study.

An itemized summary is given of costs for 42 plants delivering milk to about 21,000 customers in Springfield and Worcester. For these 42 plants the average cost of processing and retailing milk was 2.79 cts. per quart for an average daily delivery of 175 qt. of retailed milk per horse the year round. Of this 2.79 cts. 5.69 per cent is charged to depreciation, 20.34 per cent to maintenance, 17.06 per cent to circulating capital, and 56.91 per cent to labor.

Classifying 80 of the plants included in this study by size and kind of business it is noted that for plants of from 500 to 1,000 qt. daily capacity the distribution costs were 1.64 cts. per quart for all deliveries, and 2.05 cts. per quart for retailed milk. For plants of from 1,000 to 2,000 qt. capacity these costs were 1.82 and 2.23 cts. per quart. The plants of less than 500 qt. daily capacity averaged 2.04 and 2.66 cts. per quart. The cost of retailing milk in the 3 plants doing a mixed business of more than 2,000 qt. daily was 2.92 cts. per quart, and in the 20 exclusively retail plants 2.93 cts. per quart.

Comparative costs by localities involved in this study are tabulated and discussed. A comparison was made of the business of four producers who distributed their own milk and of five dealers who bought all the milk they distributed. The average retailing cost of the producers was 2 cts. per quart against 2.16 cts. for the dealers. A striking feature of this comparison is the great difference in costs as between individuals, whether producers or dealers.

Brief studies are reported of the cost of delivery of special milk, cost of collection and distribution of wholesale milk in cans, cost of motor-truck delivery, and cost of distribution of cream. Significant facts of distribution showing individual variations, disadvantages in competitive distribution of milk, and suggestions for improving conditions are discussed.

A guide for formulating a milk ordinance (*U. S. Dept. Agr. Bul. 585 (1917), pp. 4*).—A form of milk ordinance is presented to assist the community in providing an instrument for bettering its milk supply. The ordinance is restricted to the production, handling, and sale of milk and cream as such,

and takes into consideration definitions, standards, grades, adulteration, the making of regulations, the collection of samples, and penalties. Notes are given on milk ordinances and on special features of the proposed form.

Cooperative creameries and cheese factories in Minnesota, 1914, E. D. Durand and F. Robotka (*Minnesota Sta. Bul. 166 (1917), pp. 53, figs. 7*).—A statistical study of the present status of cooperative creameries and cheese factories in Minnesota, with special emphasis on the relative importance of the cooperative and independent factories.

In 1914 there were 850 creameries in the State, of which 622 were cooperative. Of the noncooperative creameries 39 were centralizers and 189 local proprietary concerns. Of the 120,806,398 lbs. of creamery butter made during the year, 61.4 per cent was produced in cooperative creameries, 25.6 per cent in centralizers, and 13 per cent in local proprietary creameries. Over one-fifth of the total milk fat received by the cooperative creameries was obtained from whole milk, and these associations made the higher grade of butter.

Of the gross receipts the cooperative creameries paid their patrons 89.7 per cent, the proprietary creameries 87.9 per cent, and the centralizers 87 per cent. The cost of producing a pound of butter and the price paid for milk fat were somewhat higher for the cooperative creameries than for the others. The overrun varied from 20.8 per cent for the proprietary creameries to 22.5 per cent for the centralizers.

The cheese industry of the State is concentrated in a few small areas, considerably more than one-half of the cheese being made in Goodhue County. Of the 71 cheese factories in the State, 36 were cooperative, 31 were proprietary, and 4 were centralizers. The cooperative cheese factories confined themselves to the manufacture of Cheddar cheese. On the other hand, brick and Swiss cheeses were made only by proprietary factories. About three-fourths of the total cheese and four-fifths of the Cheddar cheese made in the State was made in cooperative factories. On the basis of Cheddar cheese the cooperative factories paid their patrons about 2 per cent more of the gross proceeds and 8 cts. more per 100 lbs. for milk, and received about 1 ct. more per pound for cheese than the proprietary factories.

The authors discuss the influence of the cooperative movement upon the dairy industry of the State, and methods of organizing cooperative creameries. The appendix gives the text of the Minnesota cooperative law and forms used in organizing cooperative creameries thereunder.

The manufacture of cottage cheese in creameries and milk plants, A. O. Dahlberg (*U. S. Dept. Agr. Bul. 576 (1917), pp. 16, figs. 8*).—Full directions are given for the commercial manufacture of cottage cheese, including the importance of pasteurization, equipment required, yield, use of buttermilk, cost of manufacture, and markets and prices.

VETERINARY MEDICINE.

Report of the twentieth annual meeting of the United States Live Stock Sanitary Association (*Rpt. U. S. Live Stock Sanit. Assoc., 20 (1916), pp. 256, figs. 3*).—This report of the proceedings of the annual meeting held at Chicago, December 5 to 7, 1916, includes the following papers: Gangrenous Glossitis of Horses, by T. C. Teldebold, C. S. Mather, and L. A. Merillat (pp. 29–42); Review of Research Work on Hog Cholera, by M. Dorset (pp. 42–55); Regulations to Prevent Spread of Hog Cholera, by J. I. Gibson (pp. 55–58); Hog Cholera Control in Missouri, by D. F. Luckey (pp. 58, 59); Hog Cholera Control in Iowa, by J. S. Koen (pp. 59–76); Methods of Hog Cholera Control as Carried Out by the State Veterinarian of Indiana, by A. F. Nelson (pp.

76–78); Method of Control of Hog Cholera in Ohio, by A. S. Cooley (pp. 78–81); Methods of Hog Cholera Control in Massachusetts, by E. A. Cahill (pp. 82–86); Abortion Disease As It Affects the Animal Husbandry of the United States, by A. Eichhorn and G. M. Potter (pp. 86–93); Abortion in Dairy Cattle, by W. L. Williams (pp. 93–112) (E. S. R., 37, p. 482); Abortion and the Range Cattle Industry, by C. G. Lamb (pp. 112, 113); Possibilities and Limitations in Control of Abortion, by C. J. Marshall (pp. 113–117) (E. S. R., 36, p. 883); Practically Significant Facts about Abortion Disease, by E. C. Schroeder and W. E. Cotton (pp. 117–130); Desirability of Requiring Certificates of Health, Including Tuberculin Test Certificates for Cattle and Immunization Certificates for Swine Shown at Stock Shows, Live Stock Expositions, State and County Fairs, by H. E. Williams (pp. 130–132); How Should a Tuberculin Test be Applied to Insure Accuracy in Results? by J. G. Wills (pp. 132–137); The Nurse Cow a Factor in Tuberculosis of Registered Cattle, by A. T. Kinsley (pp. 137–143); Appointment and Organization of County Live Stock Sanitary Boards, by H. Groman (pp. 143–146); Organization and Personnel of State Live Stock Sanitary Boards, by C. E. Cotton (pp. 146–153); Desirability of Exempting Range Bred and Branded Cows and Heifers from State Regulations Governing Importation of Cattle for Breeding and Dairy Purposes, by F. S. Hastings (pp. 153–157); Regulations of Interstate Movement of Live Stock, by E. M. Ranck (pp. 157–162); Reasonable Regulations for Disinfecting Stock Cars, by M. S. Cohen (pp. 162–165); Cleaning and Disinfection of Stock Cars and Yards in Canada, by F. Torrance (pp. 165–172); Accredited Herds, by O. H. Eliason (pp. 176–181); Advantages of a State Accredited Herd, by J. R. Bent (pp. 181–191); Municipal Meat Inspection, by F. A. Ingram (pp. 191–196); How the State Live Stock Sanitary Officials Can Best Serve and Cooperate in Promoting the Interests of the Live Stock Producers, by E. Z. Russell (pp. 196–204); and Live Stock Sanitation, Past, Present, and Future, by J. G. Rutherford (pp. 204–217).

Included in the reports of committees, which follow, are a tabular summary of tick eradication progress, July 1, 1906, to December 11, 1916; a paper on Infectious Stomatitis of Horses, by E. C. Schroeder; a note on oidiomycosis in cattle; a paper on Some New Centers of Anthrax, by A. T. Kinsley; and a summary of the occurrence during the year of the more important infectious diseases of live stock throughout the United States, prepared by State veterinarians. The Proposed Uniform State Regulations Governing the Movement of Live Stock are also given.

Biennial report of the State Board of Stock Commissioners, 1915–16 (*Bien. Rpt. Bd. Stock Comrs., Nev., 1915–16, pp. 23*).—The occurrence of and work with the more important diseases of live stock in Nevada are reported upon by W. B. Mack.

Report of the New York State Veterinary College at Cornell University for the year 1915–16 (*Rpt. N. Y. State Vet. Col., 1915–16, pp. 314, pls. 23, figs. 12*).—In addition to the several reports on the work of the college during the year 1915–16, the following papers are presented: Hog Cholera Transmission Through Infected Pork (pp. 60–93) (E. S. R., 37, p. 691) and Hog Cholera and Its Prevention (pp. 94–116), by R. R. Birch; Researches upon Abortion of Cattle, by W. L. Williams (pp. 117–198); A Preliminary Study of the Pathology and Bacteriology of Ovaritis in Cattle, by C. P. Fitch (pp. 199–208); Further Report on the Diagnosis of Open Cases of Tuberculosis, by D. H. Udall and R. R. Birch (pp. 209–225) (E. S. R., 36, p. 881); Leukemia and Pseudoleukemia in the Common Fowl (pp. 226–251) and Roup and Chicken-pox (pp. 252–265), by E. M. Pickens; A Study of Five Members (or So-called Species) of the Septicemia Hemorrhagica (Pasteurella) Group of Organisms, With Spe-

cial Reference to Their Action on the Various Carbohydrates, by A. M. Besemer (pp. 266–282) (E. S. R., 37, p. 583); A Study of the Fermenting Properties of *Bacterium pullorum* and *B. sanguinarium*, by S. A. Goldberg (pp. 283–293) (E. S. R., 37, p. 483); and Amyloclastic Activity in the Domestic Animals With Special Reference to the Saliva of the Horse, by C. E. Hayden (pp. 294–310).

Eleventh annual report of the State Live Stock Sanitary Board, North Dakota, 1917, W. L. RICHARDS ET AL. (*Ann. Rpt. Live Stock Sanit. Bd. N. Dak., 11 (1917), pp. 40*).—This reports upon the occurrence of and work with the important infectious diseases of live stock, particularly tuberculosis.

[Report of the] veterinary division, O. H. ELIASON (*Wis. Dept. Agr. Bul. 10 (1916), pp. 83–103, figs. 5*).—This report on the occurrence of and work with the more important diseases during the year deals particularly with tuberculosis. A discussion of a plan for accredited tuberculin-tested herds is included.

Report of proceedings under the diseases of animals acts, with returns of the exports and imports of animals for the year 1916, D. S. PRENTICE (*Dept. Agr. and Tech. Instr. Ireland, Rpt. Diseases Anim., 1916, pp. 34*).—The usual annual report (E. S. R., 37, p. 577).

Report of the civil veterinary department, Assam, for the year 1916–17, W. HARRIS (*Rpt. Civ. Vet. Dept. Assam, 1916–17, pp. 2+19*).—The usual annual report (E. S. R., 36, p. 879).

Annual report on the civil veterinary department, United Provinces, for the year ending March 31, 1917, S. G. M. HICKEY (*Ann. Rpt. Civ. Vet. Dept. United Prov., 1917, pp.* [*28*]).—This report includes data on veterinary instruction and on the occurrence and treatment of infectious diseases.

Report on the civil veterinary department (including the Insein Veterinary School), Burma, for the year ended March 31, 1917, G. H. EVANS (*Ann. Rpt. Civ. Vet. Dept. Burma, 1917, pp. 8+13, pl. 1*).—The usual annual report (E. S. R., 36, p. 879).

Annual report of the veterinary department for the year ended March 31, 1916, R. J. STORDY (*Dept. Agr. Brit. East Africa Ann. Rpt. 1915–16, pp. 62–71*).—The usual annual report on the occurrence of and work with contagious diseases of domestic animals in British East Africa.

Reports of the National Serum Institute, Holland, 1911–1915, J. POELS (*Verslag Rijksseruminricht.* [*Holland*], *1911, pp. 84; 1912–1915, pp. 150*).—These are the reports of the institution for 1911, 1912, 1913, 1914, and 1915 containing the usual data as previously noted (E. S. R., 29, p. 377).

Pharmacological studies of the ipecac alkaloids and some synthetic derivatives of cephaelin.—III, Studies on protozoocidal and bactericidal action, A. L. WATERS, W. F. BAKER, and E. W. KOCH (*Jour. Pharmacol. and Expt. Ther., 10 (1917), No. 5, pp. 341–364*).—Tests of the amebacidal action, entamebacidal effects, action on paramecia, and bactericidal action of the above-mentioned drugs are reported.

"Emetin hydrochlorid in solution of 1:1,000 when acting on water amebas for one hour, or in solution of 1:5,000 acting for three hours, destroyed many of these organisms but was not uniformly amebacidal. . . . Emetin hydrochlorid in solutions as strong as 1:100 is not rapidly destructive to *Entamœba buccalis*, in some cases not killing in one hour.

"The propyl and isoamyl ethers of cephaelin are stronger than emetin as amebacides, but their action on water amebas or *E. buccalis* can not be used satisfactorily as a comparative measure of this action. Methylating cephaelin to form emetin is known to increase the entamebacidal action as well as the protozoocidal action toward paramecia, and the substitution of the methyl group by ethyl, propyl, butyl, isoamyl, or allyl further intensifies this action. The propyl, butyl, and isoampl ethers of cephaelin possess much stronger proto-

zoocidal properties than the methyl ether (emetin). Cephaelin isoamyl ether phosphate was the most effective alkaloid of this group in killing paramecia, being 15 to 20 times as active as emetin phosphate.

"Tested on *Staphylococcus aureus* in the manner described, cephaelin propyl ether phosphate is germicidal in solutions of 1 : 222, and cephaelin isoamyl ether phosphate in solutions of 1 : 4,120. Both of these derivatives are much stronger than emetin in germicidal action."

The toxicity of salvarsan and neosalvarsan, LOUISE PEARCE and W. H. BROWN (*Jour. Pharmacol. and Expt. Ther., 9 (1917), No. 6, pp. 354, 355; Jour. Amer. Vet. Med. Assoc., 51 (1917), No. 6, pp. 835, 836*).—In experimental tests of the toxicity of these drugs, carried on with laboratory animals, neosalvarsan has shown greater irregularities in toxicity than salvarsan and produced more marked pathological alterations and impairment of vitality in experimental animals.

The Abderhalden test for pregnancy in animals, C. A. ZELL (*Jour. Amer. Vet. Med. Assoc., 52 (1917), No. 1, pp. 39–47*).—This is a general review of the theory and technique of the test, together with summarized data of the author's personal experience with it.

It is concluded that the test in animals is very reliable if a very exact technique is employed. Special care should be taken in the preparation of substrates and in the selection and use of the dialyzers. The blood sample must be taken in an absolute stage of hunger and the serum must be sterile and free of hemoglobin and blood corpuscles. In cases where it is possible, the animal should be examined for the presence or absence of any form of leucocytosis.

The value of physical examination in conjunction with the biological test is noted.

The biochemical activity of agglutinating bacteria, A. ZIRONI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 26 (1917), II, No. 1, pp. 19–23, fig. 1*).—The author studied the acid and carbon dioxid production and the reduction of methylene blue by the agglutinating bacilli paratyphoid B and cholera vibrio. No great differences were observed in the activities between the agglutinating organisms and the controls.

It is concluded that the agglutinating property possessed by bacteria does not modify their general biochemical activity or power of reproduction.

A special apparatus for determining the carbon dioxid production of cultures was devised for the work and is described.

A simple method of obtaining blood serum, M. G. WOHL (*Jour. Lab. and Clin. Med., 3 (1917), No. 1, pp. 68, 69*).—The author has found that a thin coat of paraffin on the walls of the test tubes causes blood which usually adheres to the walls of an ordinary container to yield a clear serum. The paraffin was not found to alter the serum in any way for use in either the Wassermann or Widal reactions.

Preservation of antisheep hemolytic amboceptor in glycerol, R. O. CLOCK and S. D. BEARD (*Jour. Infect. Diseases, 21 (1917), No. 4, pp. 404–408*).—"Fresh antisheep hemolytic amboceptors that were heated to 55° C. for one-half hour and then mixed with an equal volume of glycerol did not deteriorate but retained their original titer for three years. During that period anticomplementary properties did not develop. The glycerol in the glycerolated antisheep hemolytic amboceptor did not influence the complement-fixation reaction. Fresh antisheep hemolytic amboceptors that were inactivated and then preserved in glycerol . . . were not only remarkably stable but were also protected from bacterial growth for a period of three years."

Toxicity of heterologous and homologous serums, C. E. ROSER (*Jour. Lab. and Clin. Med., 2 (1917), No. 8, pp. 536–551*).—This is a general discussion of the subject and of the two principal theories of anaphylaxis.

A biblography of 51 references to the literature cited is appended.

Studies in anaphylaxis, XXI, XXII (*Jour. Immunol., 2 (1917), No. 6, pp. 525–556, 571, 572*).—Continuing previous work (E. S. R., 38, p. 78), two studies are here reported.

XXI. *Anaphylaxis in dogs.—A study of the liver in shock and in peptone poisoning*, R. Weil (pp. 525–556).—Results are presented which indicate a new function of the liver, namely, its participation in the immune reaction. "This participation does not appear to be indirect, as had previously been believed, namely, by virtue of the toxic degradation of the antigen. On the contrary, it is a direct and immediate reaction profoundly involving the functions and structure of the organ. The accompanying general symptoms appear to be merely accidental by-products of this reaction. . . .

"It is perhaps needless to add that the hepatic reaction does not occur during the course of the infectious diseases in the exaggerated form induced by the anaphylactic experiment; but that it plays a more subdued and continuous rôle can hardly be doubted, in view of the direct evidence afforded by the study of the blood in human serum sickness. Similar effects upon coagulability as determined in anaphylactic guinea pigs lead to the belief that the liver is probably a constant and important factor in the immune reaction throughout the mammalia."

XXII. *Anaphylactic reactions of the isolated dog's liver*, R. Weil and C. Eggleston (pp. 571, 572).—This is a brief note of experiments which have been interrupted. The results obtained confirm and extend the conclusions of the preceding study.

Tissue transplantation and anaphylaxis, L. Loeb (*Jour. Immunol., 2 (1917), No. 6, pp. 557–569*).—The results of the study reported show that the injection of horse serum into animals into which have been transplanted the uterus and thyroid from animals which were previously injected with horse serum does not have any distinct influence on the life and growth of the transplanted piece, nor does it noticeably alter the lymphocytic reaction on the part of the host tissue.

In cases in which a second injection is made the general health of the animal is affected and the transplanted piece may also suffer. "The lack of effect of the injections in the majority of the experiments does not of course exclude the possibility that with still further variations in dosage or time relations an influence of the sensitization to horse serum may be demonstrable. It might be especially desirable to repeat the experiment, choosing dosage and time of injection in such a way that the second injection has a definite effect on the general condition of the guinea pig. If it should again be found that in those animals in which the second injection produces general effects the state of preservation of the transplanted piece is interfered with, we would have to decide further whether in this case we are dealing with a specific effect of the injections on the transplanted piece or with a nonspecific effect, due to interference with the proper nourishment of the tissue as the result of circulatory and general metabolic changes in the host."

Anthrax, C. H. Higgins (*Canada Dept. Agr. Health Anim. Branch Bul. 23 (1916), pp. 8*).—A popular summary of information.

Tuberculosis, with special reference to cattle and pigs, G. E. Bunning et al. (*Brisbane, Queensland: Govt., 1917, pp. 13*).—This is a report of a committee appointed by the Queensland Committee of the Advisory Council of Science and Industry. The questions reported upon are the preparation of a tabulated statement of the loss directly attributable to tuberculosis, its relationship to the profitable conduct of mixed farming, the practicability of building up an export trade in pork products, and the relationship of tuberculosis to the health of the community.

Details to be observed in making a tuberculin test, C. Linch (*Jour. Amer. Vet. Med. Assoc., 52 (1917), No. 1, pp. 56–63*).—The author discusses briefly cer-

tain precautions necessary for obtaining reliable results in the tuberculin test, especially in regard to avoiding conditions which tend to cause a rise in temperature.

Piroplasmosis and anaplasmosis in Turkey (1916), W. Stefko (*Bul. Soc. Path. Exot., 10* (*1917*), *No. 8, pp. 723, 724*).—During the summer of 1916 the author observed piroplasmosis and anaplasmosis in many cattle from Russia in Trebizond, Platana, Rizeh, and elsewhere in Turkey. The percentage of fatal cases was very high, from 80 to 90 per cent. Smears from the spleen showed the presence of *Piroplasma bigeminum, P. annulatum*, and *Anaplasma centrale*, a double infection occurring very frequently. The cattle tick is the intermediate host concerned. *Ixodes corniger* and *Rhipicephalus simus* occur but are not so widely distributed.

A disease in cattle in the Philippine Islands similar to Anaplasma marginale, W. H. Boynton (*Philippine Agr. Rev.* [*English Ed.*], *10* (*1917*), *No. 2, pp. 119–127, pls. 3, fig. 1; Philippine Jour. Sci., Sect. B, 12* (*1917*), *No. 6, pp. 281–291, pls. 3, fig. 1*).—In an investigation made of a disease of three native cattle which arrived at Manila from Batan Island, bodies were found in the red blood cells that were similar to *A. marginale*, as described by Theiler and Sieber (E. S. R., 26, p. 882), and one of the cows presented the symptoms and lesions of anaplasmosis. The heart's blood of this animal was injected subcutaneously into a supposedly susceptible bull, but the blood had no effect upon this animal that could be determined, either physically or by blood examination, during a period of 226 days.

Contagious abortion of cattle, H. Welch (*Montana Sta. Circ. 61* (*1917*), *pp. 41–48, fig. 1*).—A popular summary of information.

The avenue of invasion and the behavior of the infection of contagious abortion in the uterus, W. L. Williams (*Jour. Amer. Vet. Med. Assoc., 52* (*1917*), *No. 1, pp. 13–38*).—A paper presented at the annual meeting of the American Veterinary Medical Association at Kansas City, Mo., in August, 1917.

While the original portal of entry of the abortion infection into the system in most cases of natural infection requires further study, the evidence at present points to two great sources (1) the intrauterine infection of the fetus and (2) contaminated milk fed to the new-born calf.

Bovine onchocerciasis in Argentina, M. Piètre (*Bol. Min. Agr.* [*Argentina*], *21* (*1917*), *No. 1, pp. 35–41, figs. 16*).—*Onchocerca bovis* is thought to be the species which causes this affection of cattle in Argentina. See also a previous note (E. S. R., 37, p. 80).

Tuberculous mastitis in the cow: Its pathogenesis and morbid anatomy and histology, J. M'Fadyean (*Jour. Compar. Path. and Ther., 30* (*1917*), *Nos. 1, pp. 57–77; 2, pp. 139–172, pl. 1, figs. 39*).—This is a general discussion of the subject with a review of the literature.

Coccidiosis of calf, L. B. Bates (*Proc. Med. Assoc. Isthmian Canal Zone, 8* (*1915*), *pt. 1–2, pp. 92–94*).—The author reports upon the occurrence of coccidiosis in a calf which came in contact with rabbits affected with the same disease and thought to have been caused by *Eimeria stiedæ*.

Parasites affecting sheep, C. P. Fitch (*Cornell Vet., 7* (*1917*), *No. 4, pp. 233–254, figs. 4*).—A summarized account.

The control of hog cholera, with a discussion of the results of field experiments, A. D. Melvin and M. Dorset (*U. S. Dept. Agr. Bul. 584* (*1917*), *pp. 18, figs. 2*).—This is a review of control work with hog cholera which has been carried on by the department in cooperation with State officials. While no feasible plan has yet been devised for the complete eradication of hog cholera, it is deemed entirely possible to control the losses from the disease, thus placing hog raising upon a relatively stable basis, freed for the most part from the hog-cholera menace.

"The plan of slaughter of infected herds with strict quarantine and disinfection of premises, such as has been pursued successfully in combating foot-and-mouth disease, is entirely unsuitable for the control or eradication of hog cholera in the United States. . . . Potent antihog-cholera serum, if used promptly and intelligently on infected herds, will save a large portion of hogs which would otherwise succumb."

An inquiry into the horse disease known as septic or contagious pneumonia, H. WATKINS-PITCHFORD (*Vet. Jour., 73 (1917), No. 508, pp. 345–362, figs. 6*).—The author's studies here reported indicate that septic pneumonia and its generally associated primary catarrhal condition are not infectious, nor are they directly transferable from one horse to another except under certain conditions of experimental infection. "The chief and probably the sole factor determining the establishment of the disease would appear to be a condition of lowered vitality of the mucous membrane of the respiratory tract, however brought about, thereby rendering possible the invasion of a prevalent microorganism. In this way collective outbreaks of a seemingly infectious nature become explicable on the grounds of a common exciting cause."

Equine trypanosomiasis in Morocco, H. VELU (*Bul. Soc. Path. Exot., 10 (1917), No. 3, pp. 253–260; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 6, pp. 888, 889*).—This is a report on inoculation experiments with mules, dogs, rabbits, rats, sheep, and goats with trypanosomes obtained from six different horses.

Hemorrhagic septicemia in mules, J. B. HARDENBERGH and F. BOERNER, JR. (*Jour. Amer. Vet. Med. Assoc., 51 (1917), No. 6, pp. 817–822*).—This is a report of an outbreak of hemorrhagic septicemia among young mules in Pennsylvania. The diagnosis was based upon the fact that the two cases autopsied showed characteristic lesions of the disease, as seen in the acute form in cattle, without the presence of pneumonia or any other condition to indicate that the lesions were of a secondary nature. In both cases the heart blood and tissue fluids were found teeming with typical bipolar organisms, cultures of which were readily isolated, and showed the growth characteristic of this group.

Notes in regard to horse lice, Trichodectes and Hæmatopinus, M. C. HALL (*Jour. Amer. Vet. Med. Assoc., 51 (1917), No. 4, pp. 494–504, figs. 3*).—These notes relate largely to the biology of the sucking louse (*Hæmatopinus asini*) and the biting lice (*Trichodectes parumpilosus* and *T. pilosus*) of the horse.

In longevity tests the sucking lice lived only one or two days off their host, whereas the biting lice lived from 5 to 8 days. Newly hatched lice of both the biting and sucking kinds died inside of 2 days when kept at a temperature of from 70 to 88° F. off the host animal. In Petri dishes under atmospheric conditions of humidity and at a temperature of 70 to 88°, the eggs of *T. pilosus* hatched in 5 or 6 days and those of *H. asini* in 10 to 19 days.

Incomplete tests indicate that Trichodectes is more resistant to insecticidal treatment than is Hæmatopinus. The sodium fluorid treatment, which has the advantage of being applicable in winter and apparently does not injure the hair or skin, was found to be effective against the biting lice but not successful in destroying the sucking lice.

Control of poultry lice and mites, W. F. SCHOPPE (*Montana Sta. Circ. 64 (1917), pp. 65–71, figs. 6*).—A popular summary of information.

RURAL ENGINEERING.

Irrigation of alfalfa in Imperial Valley, W. E. PACKARD (*California Sta. Bul. 284 (1917), pp. 67–84, figs. 8*).—This report is based in part on work done in cooperation with the Office of Public Roads and Rural Engineering of the U. S. Department of Agriculture and the State Department of Engineering of California.

The general conclusion is drawn that in the Imperial Valley "in order to get satisfactory yields of alfalfa a large amount of water must be supplied during the season, [and] it must be supplied frequently enough to prevent a drying of the surface soil on the one hand and water-logging of the soil on the other. This desirable condition can only be accomplished by conforming the grade of the land, the frequency of irrigation, the size of the field, and the head of water used to the types of soil to be handled. . . .

"The great danger in all sandy or porous soils is that too much water will be applied and a high water table thus formed. This condition is already prevalent in some sections where sand overlays clay. . . . The lands or borders for irrigation on this type of soil should usually not exceed one-eighth of a mile in length and, if necessary, not more than 25 to 30 ft. in width in order that the water applied may reach the lower end without oversaturating the upper end. . . . The exact length and width of the lands must depend on the condition of the surface and the degree of porosity of the soil.

"If the soil is very sandy, the lands should be both narrow and short in order to allow a quick irrigation. In addition to using smaller lands than are now being used, it would be an advantage in nearly all cases to use much larger heads of water than are at present used on this type of soil. In other parts of California a head of from 8 to 12 ft. is often run on to one land in order to get quick irrigation. . . . A head of from 3 to 8 cu. ft. per second for the very sandy soil and from 2 to 4 cu. ft. per second for the more compact sandy loams would not be too great.

"A soil auger can be very effectively used in determining the soil moisture condition where one is uncertain regarding the moisture penetration. In cases where the grade is less than 5 ft. to the mile in the directions in which the lands are built, and it can be increased to from 8 to 10 ft. to the mile by changing the direction of the lands, it should be done. . . .

"The sandy loam soils are easily irrigated, although too much or too little water is sometimes applied with the usual results. There is no good excuse, however, for not having a good moisture condition in these medium soft soils. If the alfalfa does not grow so rapidly as desired an investigation should be made of the moisture condition in the soil by the use of a soil auger or a spade. If the top soil appears too dry before irrigation it would perhaps be wise to give the field an additional light irrigation between cuttings. If the lower strata are saturated the recommendatons given for hard or clay soils should be followed.

"The problem on the hard type of soils is to get the water deep into the soil in sufficient quantities to maintain rapid growth. . . . Land should be from an eighth to a quarter mile long, very seldom running one-half mile as is now a common practice. It is difficult to handle water properly on long lands, as a flooding of the lower end can seldom be avoided. On land that is comparatively flat borders 50 to 100 ft. apart are satisfactory, but when the land is at all steep lands should be narrowed down to 25 to 30 ft. wide so that a small head will cover the surface evenly. In order to get proper penetration it is necessary to run a comparatively small head for a long time. Fields which yielded from 2.5 to 3 tons per acre per year have been made to double the yield through this system of irrigation. A small head of water requires a much longer time to travel over the field than a larger head and allows of a better penetration. Land which could be wetted only to a depth of 3 ft. when large heads were used was successfully wetted to a depth of 5 and 6 ft. by the use of smaller heads. The effect of smaller heads running for a longer time is more noticeable with furrow irrigation than with flooding, but the effect is marked in both cases. The grade of hard land should not be over 5 or 6 ft. to the mile. A

grade of 4 ft. is satisfactory if the land is properly leveled. Drains should be made at the lower ends whenever practicable, as scalding is very common on this type of soil. The drains should be large enough to prevent the accumulation of water at the lower ends."

Irrigation of grain, W. W. McLaughlin (*U. S. Dept. Agr., Farmers' Bul. 863 (1917), pp. 22, figs. 7*).—This states that flooding from field ditches is the usual method of handling water in irrigating grain, but that the border and basin methods are also adapted to such crops. These methods are described in detail and the proper time to irrigate, quantity of water required, and cost of growing grain under irrigation are discussed.

The irrigation of alluvial soils, A. and Gabrielle L. C. Howard (*Agr. Jour. India, 12 (1917), No. 2, pp. 185–199, figs. 4*).—Improvements in methods of irrigating crops on alluvial soils in India with a view to increasing the duty of water are described.

Pumping for irrigation, H. E. Murdock (*Montana Sta. Circ. 60 (1917), pp. 9–37, figs. 17*).—This circular deals with the design, construction, operation, and cost of pumping plants for irrigation under Montana conditions.

It is stated that with care from 0.5 to 1.5 acre-feet of water per acre may be sufficient to mature crops in Montana. Some of the subjects taken up more in detail are centrifugal, turbine, and plunger pumps, windmills, gasoline and oil engines, and electric motors for irrigation pumping. Engine, pump, and belt and pulley troubles are also discussed and remedies suggested.

"From a consideration of all the expenses connected with pumping for irrigation, all factors should be included in an estimate for the design of a plant. Economy in the cost of applying the water calls for a large plant or a storage reservoir. Saving in the engineer's salary calls for a plant where the engineer can do the irrigating. Interest and depreciation cost calls for a small plant and a long irrigating season. Before installing an irrigation pumping plant, competent engineering advice regarding its design should be secured."

The use of windmills in irrigation in the semiarid West, P. E. Fuller (*U. S. Dept. Agr., Farmers' Bul. 866 (1917), pp. 38, figs. 12*).—This is a revision of Farmers' Bulletin 394 (E. S. R., 23, p. 395). It deals with sources of water supply, quantity of water available, sinking wells, well casing, capacity of mills, choice of tower, erection and maintenance of mills, pumps, and reservoirs. A final section describes windmill-pumping installations in present use. Considerable practical data in tabular form are included.

Practical information for beginners in irrigation, S. Fortier (*U. S. Dept. Agr., Farmers' Bul. 864 (1917), pp. 38, figs. 23*).—This is a revision of and is designed to supersede Farmers' Bulletin 263 (E. S. R., 18, p. 482). "The first few pages contain some suggestions to those who are confronted with the task of selecting a farm under an irrigation system. Arid soils and water supplies are considered in a general way from the standpoint of the irrigator. The greater part of the paper is taken up with a somewhat fuller description of how to locate and build farm ditches, how to prepare land to receive water, how to irrigate a few of the staple crops, and how much water to apply."

Practical methods of measuring flowing water, C. O. Wisler (*Mich. Engin., 34 (1916), pp. 102–115; abs. in Chem. Abs., 11 (1917), No. 5, p. 507*).—In addition to gravimetric, volumetric, and weir methods, chemical gauging is described.

In this method some cheap chemical, usually salt, is added to the water at a constant rate. "At a point downstream where a thorough, uniform mixture has occurred samples are taken and the degree of dilution determined. If W pounds of NaCl be added to a stream whose discharge is Q cu. ft. per second, and it is found that N pounds of water contain 1 lb. of NaCl, the total discharge Q in

cubic feet per second will be WN/62.5. If V represents the mean velocity of the stream and *b* the breadth, then, when the average depth lies between *b*/10 and 3*b*/10, complete mixture occurs at a distance downstream=6*b* and at a time when the addition of the chemical has continued at least 24*b*/V seconds. Samples must not be taken more than 6*b*/V seconds after the addition of the chemical has ceased. These rules do not apply to streams whose average depth is less than *b*/10; then the point and time of sampling must be made by trial."

A bibliography is included.

Hydraulic conversion tables and convenient equivalents (*U. S. Geol. Survey, Water-Supply Paper 425–C (1917), pp. 71–94*).—Specially prepared tables are given which afford a ready means of conversion between the terms in common use in hydraulic computations. These should be of material assistance to irrigation engineers.

Ground water for irrigation in Lodgepole Valley, Wyoming and Nebraska, O. E. Meinzer (*U. S. Geol. Survey, Water-Supply Paper 425–B (1917), pp. 37–69, pls. 3, fig. 1*).—This report deals with the underground waters of an area of about 2,200 square miles in southwestern Nebraska and southeastern Wyoming. Analyses of the waters are given which show them to be satisfactory for irrigation and domestic use. Data concerning wells in Laramie County, Wyo., and Kimball, Cheyenne, and Deuel Counties, Nebr., are also given.

"Wells yielding enough water for practical irrigation can be obtained in most parts of Lodgepole Valley and the total irrigated area could be considerably increased by pumping. However, the area now irrigated is very large in comparison to the size of the stream, because ground water is supplied to the stream during the irrigation season. Extensive pumping of ground water would reduce the available supply of stream water, although the decrease in stream water would be less than the increase in pumped well water. Pumping on a moderate scale will probably not appreciably reduce the supply of stream water and is doubtless practicable in Lodgepole Valley. Flowing wells could probably be obtained by deep drilling in some parts of the valley, but the prospects are not encouraging for obtaining supplies from deep wells in quantities or at costs practicable for irrigation."

In an appended article entitled Cost of Pumping for Irrigation in Western Nebraska, data are reported by H. C. Diesem as summarized in the following tables:

Results of operating certain pumping plants in Nebraska in 1914.

Plant				Pumping.		Cost.			Area to which water was applied once.
No.	Engine horse-power.	Pump.[1]	Lift.	Time.	Quantity.	Total for season.	Per acre-foot.	Per acre-foot per foot lift.	
			Feet.	*H. m.*	*Acre-feet.*			*Cents.*	*Acres.*
1	25	5 T	45	436 35	40.11	$78.52	$1.958	4.35	100.0
2	15	6 H	34	487 00	47.07	70.69	1.502	4.42	104.6
3	25	6 V	40	116 55	19.68	37.27	1.894	4.74	68.0
4	15	5 V	28	190 00	27.23	43.65	1.603	5.73	63.0
5	20	6 V	31	128 00	18.88	36.19	1.917	6.18	41.5
6	22	6 H	43	96 00	13.12	36.40	2.774	6.45	35.0
7	15	5 H	32	600 25	80.06	185.76	2.320	7.25	220.0
8	30	6 V	44	81 00	15.79	54.11	3.426	7.79	60.0
9	15	6 V	35	355 30	26.96	82.40	3.056	8.73	120.0
10	20	5 H	33	176 00	14.67	43.48	2.962	8.98	48.5
11	18	5 H	28	151 00	14.23	38.40	2.699	9.63	28.0
12	15	6 H	28	90 00	11.70	42.54	3.636	13.00	20.0

[1] Centrifugal pumps. Figure indicates number or size. H=horizontal, V=vertical, T=turbine.

Number and cost of irrigations at certain pumping plants in Nebraska in 1914.

Plant No.	Crop irrigated.	Area irrigated, in acres.	Number of irrigations.	Water applied.		Cost.	
				Total, in acre-feet.	Acre-inches per acre.	Per acre.	Per acre-inch.
1	Corn	40.0	2	30.29	9.09	$1.482	$0.163
2	Beets	37.3	2	32.86	10.56	1.322	.125
3	Corn	25.0	2	14.62	7.02	1.104	.158
4	do	20.0	2	15.05	9.03	1.206	.133
5	do	10.0	2	9.38	11.25	1.754	.160
6	do	35.0	1	13.12	4.50	1.040	.231
7	do	110.0	2	80.06	16.01	1.689	.106
8	do	3.0	3	1.76	7.04	2.008	.290
9	do	60.0	2	26.96	5.39	1.373	.255
10	do	48.0	1	13.54	3.39	.835	.247
11	do	12.0	2	10.66	10.66	2.397	.225
12	do	20.0	1	11.70	7.02	2.127	.303

Surface water supply of western Gulf of Mexico basins, 1916 (*U. S. Geol. Survey, Water-Supply Paper 438 (1917), pp. 106+XXVI, pls. 2*).—This report presents the results of measurements of flow made on the Colorado, Rio Grande, and other river basins in the western Gulf of Mexico drainage area, together with the usual list of gauging stations and publications.

Recent advances in the improvement of water supplies, C. E. A. WINSLOW and ANNA M. R. LAUDER (*Conn. Soc. Civ. Engin., Trans. and Proc., 1915–16, pp. 17–27; abs. in Chem. Abs., 11 (1917), No. 5, p. 507*).—The efficiency of each of the four principal methods by which surface water may be made safe for drinking, namely, storage, slow sand filtration, mechanical filtration, and disinfection, are discussed, and typical examples noted with data on cost of operation.

The domestic water supply on the farm, H. E. MURDOCK (*Montana Sta. Circ. 66 (1917), pp. 83–103, figs. 12*).—This circular deals with the sanitary aspects of farm water supplies including wells, springs, and cisterns, and describes simple farm water supply systems which are adapted to Montana conditions. A brief section on farm sewage disposal is included.

Detection of typhoid and paratyphoid bacilli in feces and water, F. DIENERT and G. MATHIEU (*Compt. Rend. Acad. Sci. [Paris], 164 (1917), No. 2, pp. 124–126; abs. in Jour. Soc. Chem. Indus., 36 (1917), No. 4, p. 232*).—Experiments are reported in which it was found that coli bacilli developed very slowly during a period of 24 hours in a peptone solution containing variable quantities of malachite green and generally did not grow at all with concentrations of 1:8,000. The typhoid bacilli grew more rapidly in solutions containing from 1:5,000 to 1:2,000 concentrations of malachite green. Paratyphosus B grew more rapidly than paratyphosus A, and a solution containing a 1:2,600 concentration of malachite green was totally discolored by the growth of paratyphosus B in 24 hours. The use of malachite green in detecting and distinguishing pathogenic intestinal organisms in water and sewage is considered feasible, although all commercial malachite green is not suitable for this purpose.

The presence of paratyphoid organisms was easily demonstrated in Seine River water by this method.

The use of aromatic chloramin compounds for the sterilization of water for drinking purposes, R. L. M. WALLIS (*Indian Jour. Med. Research, 4 (1917), No. 4, pp. 800–817*).—Experiments on the use of chloramin T (para-toluene-

sodium-sulphochloramid) as a disinfectant for treating drinking water are reported.

It was found that 0.04 gm. of chloramin T will completely sterilize 1 liter of any water in 10 hours even when 10,000 organisms per cubic centimeter are present. "The water so treated is entirely devoid of any unpleasant taste, and will remain sterile for at least four days. There is evidence to show that its activity is markedly increased by the presence of organic matter in solution in the water, in fact organic matter is essential for the compound to exert its action as a disinfectant. Chloramin T possesses many advantages over bleaching powder as a chemical reagent for sterilizing water, more particularly its definite and unalterable composition, its stability in solution, nontoxicity, absence of corrosive action, and nonproduction of an unpleasant taste in the treated water. All the results tend to demonstrate that we have in certain of the chloramins the ideal reagent for sterilizing water on a large scale."

Standard road sections (*Helena, Mont.: Mont. State Highway Com. [1917], pp. 12, figs. 10*).—Diagrammatic illustrations of standard road sections used by the Montana State Highway Commission are given.

Standard plans, box culverts, slab and girder bridges, 1916 (*Des Moines, Iowa: Iowa State Highway Com., 1916, pp. 27, figs. 26*).—This book contains a complete set of standard plans for concrete highway culverts and slab and deck girder bridges issued for 1916 by the Iowa State Highway Commission.

"The box culvert designs . . . are prepared for both straight and flaring wing walls for span lengths ranging from 2 to 12 ft. The standard slab designs . . . are prepared for lengths of span from 14 to 24 ft. The deck girder designs . . . range in span lengths from 24 to 40 ft."

Highway bridges, 1917, G. Hogarth (*Ann. Rpt. Dept. Pub. Highways Ontario, 1916, App., pp. 26, figs. 25*).—This is an appendix to the annual report of the Department of Public Highways of Ontario and deals with the construction of highway bridges in the Province. It is in part explanatory of the specifications for steel and concrete bridges issued by the department and also complementary to the series of general plans issued for steel and concrete bridges.

Tests of concrete slabs to determine the effect of removing excess water used in mixing, A. N. Johnson (*Good Roads, n. ser., 14 (1917), No. 3, pp. 31, 32, fig. 1*).—Experiments with 12 concrete slabs 2.5 ft. wide, 5.5 ft. long, and 5 in. thick to determine the influence on strength of removing the excess water by rolling, as is being done in concrete road work, are reported. A 1:2:3 mixture was used, and the consistencies used were a dry and a wet consistency finished with a wood float and a wet consistency finished with a roller.

It was found that "those slabs finished with the roller developed a very considerable increase in strength over the slabs merely hand-finished. The four slabs of wet consistency that were finished by hand have an average modulus of rupture of 308 lbs. per square inch, while the four slabs finished with the roller have an average modulus rupture of 369 lbs. per square inch, or an increase of almost 20 per cent. . . . The slabs that were made of a stiffer mixture, indicated in the table as medium consistency, giving an average modulus of 340 lbs. per square inch, are stronger than those of the wet consistency, finished in the same manner; but the wet-consistency slabs finished with the roller are stronger than those of the medium consistency, showing an increase of nearly 10 per cent.

"The results seem to indicate clearly the value to be gained by the use of the roller to finish a concrete road; that it is possible by proper manipulation of concrete to secure increased strength and density of a character most desirable for a concrete road surface; and that such surplus water as may be required

to facilitate placing concrete in road work can be effectively removed by this simple expedient."

Calcium carbid and acetylene, G. G. Pond (*Bul. Dept. Chem., Penn. State Col., 1917, 3. ed., pp. 139*).—This extension report on acetylene gas heating and lighting is the second revision and enlargement of material previously noted (E. S. R., 12, p. 697) and should be of value in a study of rural lighting systems.

Haymaking machinery, J. R. Bond (*Jour. Bd. Agr. [London], 24 (1917), No. 2, pp. 129–142, figs. 4*).—Machines and devices used in England in the making processes and carrying operations of haymaking are described and illustrated.

Homemade silos, H. Rabild and K. E. Parks (*U. S. Dept. Agr., Farmers' Bul. 855 (1917), pp. 55, figs. 47*).—This is a revision of Farmers' Bulletin 589 (E. S. R., 31, p. 591.)

The construction of the wood-hoop silo, J. B. Davidson and J. E. Stiles (*California Sta. Circ. 173 (1917), pp. 15, figs. 12*).—This circular briefly explains the details of wood-hoop silo construction with special reference to conditions, requirements, and available materials and facilities of California.

Poultry houses and appliances (*London and New York: Cassell & Co., Ltd., 1917, pp. 156, figs. 226*).—This is a popular handbook of information on the subject, containing the following chapters: The building of poultry houses; troughs and fountains; nesting boxes and trap nests; coops; some special pens; scratching sheds, etc.; hurdles, fences, etc.; various poultry houses described in detail; ornamental poultry houses; intensive-system poultry houses described in detail; heated chicken-rearers; cold chicken-rearers; and grain distributor for poultry.

Chicken houses, R. M. Sherwood (*Kansas Sta. Circ. 61 (1917), pp. 15, figs. 16*).—This circular points out the general requirements of chicken-house construction for Kansas conditions, and includes illustrations of a number of chicken houses and floor plans for the same, showing various plans of building, arrangements of fixtures, and systems of ventilating.

Ice houses, H. E. Murdock (*Montana Sta. Circ. 59 (1916), pp. 8, figs. 4*).—This circular deals with the design and construction of farm ice houses, with special reference to Montana conditions.

RURAL ECONOMICS.

Agricultural cooperation and organization, G. Radford (*London and New York: Hodder & Stoughton, 1917, 2. ed., pp. 154*).—The author has defined the ultimate object of the cooperative movement as it affects the land in the production of more, better, and more uniform qualities in, stocks and crops, and the distribution of these when produced, both more efficiently and at a lower cost. He has applied these principles to the production of such articles as milk and milk products, meat, bacon, and poultry, and to finance, insurance, and transportation.

Cooperative buying by farmers' clubs in Minnesota, E. D. Durand and H. B. Price (*Minnesota Sta. Bul. 167 (1917), pp. 3–44, figs. 2*).—The authors have described a number of typical buying organizations of farmers as found in Minnesota, and have summarized their investigations as follows:

"In Minnesota, cooperative buying by farmers' clubs and other similar associations and groups is comparatively unimportant from the standpoint of magnitude of business. Cooperative buying is more common in the less densely settled sections of the eastern, central, and northern parts of the State than elsewhere. The commodities chiefly bought are those which are bulky and are well standardized, the most important being feed, flour, and twine.

"In cooperative buying the direct money cost to the consumer usually represents some saving as compared with the prices that would otherwise have to

be paid. In some cases this saving is considerable, but in other cases insignificant. Judgment as to the actual advantage or disadvantage of cooperative buying can not be based exclusively on the amount of direct saving thus computed. . . .

"For certain classes of goods, such as groceries and hardware, manufacturers and wholesale dealers often refuse to give wholesale prices on cooperative purchases on account of the resulting injury to retail dealers who are their customers. Retail dealers, as might be expected, are usually opposed to cooperative buying from outside concerns, and maintain that in the long run the practice will injure not only them but also their customers."

Cooperation in Finland, H. GEBHARD, edited by L. SMITH-GORDON (*London: Williams & Norgate, 1916, pp. XIII+190, pl. 1*).—This is a translation of the revised edition of Gebhard's work. The author reviews the cooperative movement in the various countries of Europe and traces the origin and development in Finland. He also describes in some detail the Finnish local cooperative societies, their functions, and also their federation into the national organization.

First annual report of the State market director of California for the year ended December 1, 1916, H. WEINSTOCK (*Ann. Rpt. State Market Dir. Cal., 1 (1916), pp. 110*).—This report gives in detail an account of the different marketing organizations which have been actively identified with the work of the State market director's office during the year ended December 1, 1916.

Federal Farm Loan Bureau, H. QUICK (*Chicago: Blackstone Inst., 1917, pp. 34*).—This pamphlet consists of one of a series of lectures, and explains the circumstances leading up to the organization of the Federal Farm Loan Bureau, the plans and purposes of its organization, and the law under which it operates.

Scientific method of appraising farm lands (*[San Francisco], Cal.: E. M. Ginty, 1917, pp. 16, figs. 6*).—This publication is an outline of different factors that go to make up farm values and of methods that may be used in making appraisements.

Harvest help and wages [in Saskatchewan], T. M. MOLLOY (*Saskatchewan Dept. Agr., Ann. Rpt. Bur. Labor, 6 (1917), pp. 24–27*).—These pages call attention to the labor situation, methods of obtaining labor, and the sources used.

Child labor in the sugar-beet fields of Colorado, E. N. CLOPPER and L. W. HINE (*Child Labor Bul., 4 (1916), No. 4, pt. 1, pp. 176–206, figs. 17*).—The authors have described the participation of children in the growing of sugar beets, and its influence upon their education and physical development.

Race suicide in the United States, W. S. THOMPSON (*Sci. Mo., 5 (1917), No. 1, pp. 22–25*).—In this article the proportion of children born to women of child-bearing age is compared for rural and urban populations. The apparent influence of geography, difference in increase of native and foreign stock in the cities, and reasons for the more rapid increase of rural over urban population are reviewed.

Missouri country life conference, 1917 (*Missouri Bd. Agr. Mo. Bul., 15 (1917), No. 2, pp. 99*).—The greater part of the discussions in this conference relates to the methods of organizing farms, developing leadership, and the different rural education problems.

Rural life in Litchfield County, C. S. PHELPS (*Norfolk, Conn.: Litchfield Co. Univ. Club, 1917, pp. 137*).—This report describes the topography, soil, early settlement, historical development, and present conditions of agriculture in the county.

A brief social and economic survey of Floyd County, ESTELLE HUGHES (*Bul. State Normal School [Athens, Ga.], 4 (1917), No. 4, pp. 15*).—This report is based on the study of the census and other documents to show the agricul-

tural population and educational and transportation situation in Floyd County, Ga.

A brief social and economic survey of Muscogee County, Ella Jones (*Bul. State Normal School* [*Athens, Ga.*], *4* (*1917*), *No. 3, pp. 12*).—This report gives data corresponding to the above for Muscogee County, Ga.

New Hampshire farms (*Concord, N. H.: N. H. Dept. Agr., 1916, pp. 22, pl. 1, figs. 16*).—This publication contains a list of farms available for farming or summer homes and indicates their size, types of buildings, and distances from railroads and educational and religious institutions.

English farming, past and present, R. E. Prothero (*London: Longmans, Green & Co., 1917, 2. ed., pp. XV+504*).—This book is a reprint of a volume previously noted (E. S. R., 28, p. 689). The tables on wheat prices and agricultural statistics have been brought up to date.

The national food policy (*Roy. Soc.* [*London*], *Food* (*War*) *Committee, Nat. Food Policy* [*Papers*], *1917, Danger of Restricting Consumption of Meat, pp. 3; Primary Importance of Bread, pp. 6; Maximum Prices, p. 1; Price Fixing, pp. 3; Memorandum upon a Limited Measure of Food Distribution, pp. 3*).—These papers relate to methods of meeting the food situation in Great Britain, both at the present time and in the future.

It is pointed out that it should be the policy to maintain a full supply of cereals at all cost; that maize, barley, rice, and other grains should be preserved for human consumption; and that each individual should be urged to reduce his food to the minimum required for efficiency. Measures should be adopted to reduce the number of cattle, sheep, and swine, and the tonnage if possible should be decreased by decreasing the importation of meat. The committee also believe that no restrictions should be placed on the consumption of meat, and that home-grown meat should be used for the army, navy, and civil population. They point out that a high price is not only a strong incentive to production but also an insistent reminder of the necessity of avoiding waste. The free play of prices provides the motive power for the distribution of produce.

The economic resources of the German colonies (*Bul. Imp. Inst.* [*So. Kensington*], *13* (*1915*), *Nos. 1, pp. 110–134; 2, pp. 233–260, fig. 1; 3, pp. 392–422; 4, pp. 559–581*).—These articles describe the development of native and European agricultural products and livestock in German East and Southwest Africa, and the German West African colonies and Pacific possessions.

Annual report on the agricultural department for the year 1915, R. Armstrong (*Ann. Rpt. Agr. Dept. Zanzibar, 1915, pp. 44–68*).—This report gives for Zanzibar the production and trade in agricultural products, and the report of the meteorological conditions during the year.

AGRICULTURAL EDUCATION.

Work of school children during out-of-school hours, C. D. Jarvis (*U. S. Bur. Ed. Bul., 20* (*1917*), *pp. 28*).—This investigation is concerned with the education of school children who work during out-of-school hours; the amount money value, and nature of the work performed; how school children spend their leisure hours; why they leave school at an early age; and to what extent gardening can replace less desirable forms of employment. It covers the activities of a total of 14,391 boys and girls of the fifth, sixth, and seventh grades, of urban communities in 11 States, namely, Alabama, Arkansas, Connecticut, Delaware, Iowa, Michigan, Missouri, Ohio, Pennsylvania, Utah, and Washington.

Of these children 5,181 were employed during summer vacation. Their total earnings amounted to $68,342, or an average of $13.19, but 7 per cent averaged

\$69.01. Twenty-seven per cent of the children worked during out-of-school hours throughout the year, with average weekly earnings of \$1.51; of these 7 per cent averaged \$2.67 per week.. Of the total number of workers, nearly 33 per cent of the boys and 26 per cent of the girls performed farm work for pay, including the picking of fruit, weeding, hoeing and cultivating crops, and caring for poultry, horses, and other live stock.

From the standpoint of educational opportunities farm work is considered to rank high. Children gain skill from working with the hands, and such varied experiences as are offered on the farm furnish abundant opportunity for an all-round development of the senses. They also have an opportunity to observe some of the workings of nature, which should make them broader and more contented. From the vocational standpoint, also, children engaged in farm work are able to learn many things that prove of use to them in later life. Ability to grow plants is valuable from both vocational and avocational standpoints.

It was found that 8.5 per cent of the children desired to leave school. Of these 34 per cent frankly stated they do not like school, and 60 per cent would rather go to work. As a remedy for this school-leaving problem the author recommends (1) remunerative employment for children while attending school, such as home gardening projects, the educational value of which is greatly enhanced by conducting them on a real money-earning basis; (2) a change in educational methods aiming to vitalize school work and thus make school more interesting and retardation less common; and (3) the establishment of continuation courses for children who must leave school.

Statistical data show that 27 per cent of the children conducted independent garden exercises. These gardens averaged 1,101 sq. ft., and gave an average return of \$3.59. There were 361 children who raised produce valued at \$10 or over, 81 valued at \$25 or over, 30 valued at \$40 or over, and 22 valued at \$50 or over. There was available for all pupils an average of 961 sq. ft. of land for gardening, which with intelligent handling should produce, at 10 cents per square foot, returns of \$96.10 to each operator. To provide for gardening and other practical arts instruction would necessitate the reorganization of school work, including the rearrangement of the school year so that the summer vacation may come in the middle of the year instead of at the end.

Farm work and schools in Kentucky, E. N. Clopper (*Child Labor Bul.*, 5 (*1917*), *No. 4*, *pp. 178–206*, *figs. 22*).—This report is concerned with the interference of farm work with the attendance of children at rural schools in Kentucky and is based on a study made in seven selected counties. The author calls attention to the fact that the 1910 Federal census of occupations credits Kentucky with 64,692 child workers from 10 to 15 years of age, of whom 82 per cent are reported as agricultural laborers, most of them on the home farm, as compared with slightly less than 72 per cent for the entire country.

The study indicates that farm work, including all processes of tobacco culture, except firing; plowing, cultivating, and cutting corn; filling silos; thrashing grain; picking berries; making hay; and drying apples interferes more than any other factor with the education of rural children in Kentucky.

The economic situation of the small farmer in Kentucky is discussed somewhat in detail, inasmuch as the demands of his work and his inability to hire labor may be responsible for his being unable to keep his children in school throughout the term. It is stated that "the child labor laws of the States do not apply specifically to agriculture, although an act of Nebraska forbids children under 16 years of age to work in beet fields at night or more than 8 hours a day, and one of New York provides that boys over 12 years of age must not work more than 6 hours a day in gathering produce, whatever that

may mean. The only restrictions in the statutes of Kentucky that apply to child workers on farms concern their attendance at school."

The education of city boys on the land: A preliminary inquiry, J. J. Findlay (*Jour. Bd. Agr.* [*London*], *24* (*1917*), *No. 1, pp. 21–32*).—The author discusses the results of an inquiry to discover what efforts are being made to educate city boys over 12 years of age to fit them for rural occupations, i. e., not merely to give them lessons in a country school, but to provide them with first-hand experience of country occupations. He found only two institutions in Great Britain that definitely aimed to teach agriculture to city boys, viz, the Scouts' Farm established by Sir Robert Baden Powell at Wadhurst in Kent and the endowed school at Staunton-on-Wye, Hereford.

Institutions for waifs and strays and the reformatory and industrial schools bring a certain portion of their inmates back to the land in two ways: (1) By sending boys who are educated wholly in the cities to farmers under license, very often to South Wales or to Ireland, thus keeping them at farm work until they are at least 18 years of age; and (2) by training boys on farms which are maintained side by side with other industries at some of these institutions. In this connection mention is made of the Lancashire Branch of the National Children's Home and Orphanage at Edgeworth, which is practically a model country village in which boys and girls engage in all of the domestic, industrial, and agricultural crafts which their common life demands; also of the Desford Farm School, conducted for some four years at Evershot in Dorsetshire, which is a certified industrial school, specializing in farming and gardening, as well as in the staple trades of Leicester.

Most of the boys turned into farmers at Wadhurst and in the industrial schools, etc., have gone to the colonies because in England they can hope to secure at the best only a scanty livelihood. In the author's opinion the whole problem is at present one mainly for private initiative, and the remedies must clearly be sought in the field of social organization. Measures for the improvement of this unsatisfactory state of things are discussed.

Vocational education (*Cal. Bd. Ed. Bul. 23* (*1917*), *pp. 29*).—This bulletin contains the general regulations adopted by the California State Board of Education, July 19, 1917, for the establishment and maintenance of Federal and State aided vocational education in California. It deals with Federal and State aid available for, and the provisions and requirements of the Federal and State acts relating to, part-time vocational courses in agriculture; vocational courses, and classes in the trades, household economics, and industries; and continuation classes in civic and vocational subjects.

For the vocational courses in agriculture a one-year course of not less than 36 weeks is recommended at the present time, but a second year may be added later if a sufficient number of pupils desire the work. Not less than three hours a day of each pupil's time must be devoted to farm-project work and to the instruction pertaining thereto, and to farm mechanics. Each pupil must also conduct at least one farm project during the school year, such as the producing and marketing of farm, orchard, vineyard, or garden crops, or of bees, poultry, stock, or other farm animals or their products, and upon a commercially productive basis.

Schools maintaining vocational agricultural courses under these acts must also provide for the organization and supervision of agricultural clubs, under the agricultural extension department of the University of California, for pupils not maintaining project work as a part of such courses.

The regulations also deal with the sources of financial support, qualifications of teachers, etc.

Report of agriculture in the high schools of Michigan (*Mich. Agr. Col., Dept. Agr. Ed. Bul. 18 (1917), pp. 21, figs. 11*).—This bulletin gives a brief account of the actual methods of instruction and the results obtained during the past year.

The instruction comprises prevocational agriculture and garden practice in the seventh and eighth grades, plant and animal industry in the ninth and tenth grades, and special agricultural subjects, such as crops, soils, horticulture, and farm engineering in the eleventh and twelfth grades. In 1916–17, 57 high schools employed college-trained instructors and 8 employed instructors with less than college training; 25 high schools had developed 4-unit courses, 24 offered 4 units by alternating the last two years, and 8 schools had 2-year courses. The total number of students enrolled in agricultural subjects was 2,414, of whom 644 conducted farm-project work and 1,298 garden-project work. Twenty instructors were employed for 12 months in the year and 26 gave prevocational instruction in grades 7 and 8. Seventeen schools had land which was used for demonstrations and projects. A list of the schools and teachers giving instruction in agriculture in 1917–18 is included.

Report of a visit to the agricultural schools, J. Malmros (*An. Agron. [Santiago de Chile], 8 (1914), No. 4, pp. 5–23*).—This is a report on the work of the four schools of agriculture in Chile, located respectively at Concepcion, Chillan, Cauquenes, and Talca, under the control of the General Inspection of Agriculture.

List of agricultural and horticultural officials, institutions, and organizations (*Dept. Landb., Nijv. en Handel [Netherlands], Verslag. en Meded. Dir. Landb., No. 2 (1917), pp. 139*).—This is the official organization list of the direction of agriculture of the department of agriculture, industry, and commerce, including higher and secondary agricultural education and research institutions, agricultural and horticultural winter schools and courses, itinerant instructors, and associations in the Netherlands in 1917.

Preparation of teachers for nature study and elementary agriculture by the normal schools, E. R. Downing (*School Sci. and Math., 17 (1917), No. 7, pp. 609–621*).—Data are given in tabular form on the nature study and agriculture courses, and incidentally courses in botany and zoology, offered to normal school students, and the nature study or elementary science work given in the practice schools. The information was obtained through questionnaires sent to the normal schools in this country.

Plant ecology and its relation to agriculture, W. G. Waterman (*Science, n. ser., 46 (1917), No. 1184, pp. 223–228*).—In this paper delivered before the Illinois Academy of Science, February 23, 1917, the author discusses the content of ecology and its relation to agriculture.

He finds that "up to the present the method in agricultural texts and courses has been to teach a little plant morphology, a chapter on plant activities, and then nine-tenths of the work on agricultural practice." He would recommend in addition the insertion of a section on ecological principles covering the content of ecology as outlined. It should be general and theoretical and yet so related to agricultural practice as to form a suitable foundation for the agricultural course.

Report of committee on education: Amount of agricultural engineering work offered in agricultural colleges, A. H. Gilbert (*Trans. Amer. Soc. Agr. Engin., 10 (1916), No. 1, pp. 101–104*).—This is in continuation of a report made at the meeting of the preceding year (E. S. R., 34, p. 498) on an investigation of the amount of agricultural engineering work offered in the State agricultural colleges in the United States and Canada.

The luncheon as a project in elementary and secondary education, JENNY H. SNOW (*Jour. Home Econ., 9 (1917), No. 8, pp. 361–364*).—This is a discussion, from the standpoint of the large city, of some of the things that are being done and planned along this line in Chicago. Both class and individual projects are found possible, those being practical applications of lessons learned. Work which is not educationally valuable becomes paid service.

Soils and fertilizers, T. L. LYON, edited by L. H. BAILEY (*New York: The Macmillan Co., 1917, pp. XX+255, pls. 16, figs. 34*).—This text on soils for secondary schools, short courses in agriculture, and summer courses for teachers, deals with soils as a medium for plant growth; soil formation and transportation; texture and structure of soils; organic matter; soil water; plant food; materials in soils; acid and alkali soils; the germ life of the soil; soil air and soil temperature; nitrogenous, phosphoric acid, potash, and sulphur fertilizers; lime; the purchase, mixing, and use of fertilizers; farm and green manures; and crop rotation. Questions and field and laboratory exercises accompany each chapter. No chemical symbols or formulas have been used.

Our bird book, A. C. WEBB (*Kansas City, Mo.: Pioneer Publishing Co., 1917, pp. XII+244, pl. 1, figs. 28*).—This nature reader, prepared for use in schools, presents a simple and definite educational plan for the study of common birds. In connection with the lesson on each bird, there is a blank page for a record of the pupil's personal observations. On a long sheet inserted in the book are the pictures of 14 birds in their natural colors, which are to be mounted on specially prepared pages scattered throughout the book in connection with the stories describing the birds.

Field lore for young farmers, KATHERINE A. GRIMES, edited by W. L. HUTCHINSON (*Dallas, Tex.: The Southern Publishing Co., 1917, pp. X+194, figs. 86*).—This text on nature, intended for the graded schools, is devoted to a study of such topics as nature's elements and compounds, the soil, plant food, inside and outside growers, the right plant in the right place, rotation of crops, handling difficult soils, planting, taking care of the crop, cotton, beneficial and injurious weeds, birds, and insects, plant diseases, how to get good seed, the life work of the plant, how seeds travel, the farm wood lot, the home garden, making home attractive, and chickens.

Outlines of agricultural economics, E. G. NOURSE (*Chicago: Univ. Chicago Press, 1917, pp. IX+95, figs. 3*).—This is a class book of questions and problems to accompany the author's text on agricultural economics, already noted (E. S. R., 36, p. 390).

Home demonstration work as correlated with the Louisiana public schools, ALICE S. HICKMAN ET AL. (*La. Agr. Col. Ext. Div. Bul. 24 (1917), pp. 170, figs. 33*).—The home demonstration work outlined in this bulletin comprises four projects, gardening, canning, cooking, and sewing, each extending over four years and with the first year in the elementary or grammar schools. A credit of one unit for high school graduation is given on completion of the four years' work.

Report of the women's institutes of the Province of Ontario, 1916 (*Rpt. Women's Insts. Ontario, 1916, pt. 1, pp. 120, figs. 2*).—This is the annual report on the progress of women's institute work in Ontario for 1916. It consists of the proceedings of the annual conventions of 1915, together with statistical data for 1915–16. The demonstration lecture work included 75 courses in food and cooking, sewing, and home nursing and first aid, attended by about 2,700 women and girls. The 1916 home garden and canning contest was participated in by 22 branch institutions representing a total of 245 gardens.

MISCELLANEOUS.

Annual Report of California Station, 1917 (*California Sta. Rpt. 1917, pp. 95, pls. 2, fig. 1*).—This contains the organization list and a report of the director on the work and publications during the year, including a list of the station projects, some data pertaining to the instruction and extension work of the college of agriculture, a reprint of the publication previously noted (E. S. R., 37, p. 697), and a summary of the reports of the field parties conducting this inquiry.

Report of progress of work and guide to experimental plats, North Central Experiment Station, Grand Rapids, 1916 (*Minnesota Sta., Rpt. Grand Rapids Substa., 1916, pp. 64, figs. 30*).—This is a report of the work of the year. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-sixth Annual Report of Ohio Station, 1917 (*Ohio Sta. Bul. 315 (1917), pp. XXXV+5, fig. 1*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1917, and a report of the director summarizing the work and publications of the station during the year.

Monthly Bulletin of the Ohio Experiment Station (*Mo. Bul. Ohio Sta., 2 (1917), No. 9, pp. 282–315, figs. 13*).—This contains several articles abstracted elsewhere in this issue, together with the following: Entomological Survey of Ohio Wheat Fields, by H. A. Gossard; Shade Trees Eaten by Walnut Datana; The Green Soldier Bug, by R. D. Whitmarsh, an abstract of Bulletin 310 (E. S. R., 37, p. 258); Soy Beans As Human Food, by J. B. Park, an extract from Bulletin 312 (E. S. R., 37, p. 235); Hill Selection Increases Potato Yield; and notes.

NOTES.

Purdue University and Station.—A number of special courses have been established to give extra training for men preparing for military service. One of these courses deals with the handling of horses and the treatment of their more common diseases, several with gas engines, and another with military French.

A course of instruction for city garden supervisors was given in March.

The station is cooperating with the Office of Cereal Investigations of the U. S. Department of Agriculture in a study of root and systemic diseases of corn. The work is to be in direct charge of George N. Hoffer of the Bureau of Plant Industry. An elaborate equipment for these physiological and pathological investigations has been installed in the station laboratories.

Frank I. Odell has been appointed manager of the Moses Fell Annex to the station, located at Bedford. Claude Harper of the Illinois University and Station has been appointed assistant in animal husbandry for extension work with sheep.

Iowa College and Station.—Recent lines of investigation to be undertaken include studies of soft corn silage and digestion trials with lean and fat cows on maintenance, by the animal husbandry section, buying in spring *v.* wintering bees and a comparison of Italian, Carniolan, and Caucasian bees, by the entomology section, calcium balance of dairy cows, by the chemistry section, and ventilating systems for barns, by the agricultural engineering section.

M. F. P. Costelloe, head of the department of agricultural engineering since 1915, died January 12 at the age of 37 years. Prof. Costelloe was a 1906 graduate in civil engineering of the University of Nebraska and received the degree of agricultural engineer in 1916. He had had considerable experience on various engineering projects, giving special attention to irrigation, sewage disposal, and drainage.

Knute Espe and T. H. Benton, assistants in the soil survey, and G. W. Roark, assistant in chemistry, have resigned, and W. E. Whitehouse, assistant in pomology, has been given leave of absence for the period of the war. Assistants have been appointed as follows: Pomology, H. E. Nichols; soil survey, E. I. Angell; and entomology, Albert Hartzell.

Nebraska University and Station.—J. R. Cooper has resigned as associate professor of horticulture and assistant horticulturist to become professor of horticulture in the University of Arkansas, effective April 1.

Pennsylvania Station.—J. S. Owens, assistant in experimental agronomy, resigned January 16.

Virginia Station.—T. J. Murray, associate professor of plant pathology and bacteriology and associate bacteriologist, resigned February 5 to accept a similar position at the Washington College and Station.

Virginia Truck Station.—The substation established at Tasley in cooperation with the State board of agriculture five years ago has been relocated with a better farm and buildings near Onley.

Selective Service Law and Agricultural Students.—An amendment to the U. S. Selective Service Regulations is announced by the Provost Marshal General regarding certain land-grant college students in agriculture. The text of the amendment is as follows: "Under such regulations as the Quartermaster

General may prescribe, students pursuing a course of agriculture, in the senior year, in land-grant agricultural colleges, whose class standing places them in the upper third of the senior class as determined by the school authorities, may enlist in the Enlisted Reserve Corps of the Quartermaster's Department, and thereafter, upon presentation by the registrant to his local board of a certificate of such enlistment, such certificate shall be filed with the questionnaire and the registrant shall be placed in Class 5 on the ground that he is in the military service of the United States."

Progress in Agricultural Instruction in Latin America.—A recent executive decree in Colombia provides for the establishment of a tropical agricultural station annexed to the national institute of agronomy in the municipality of San Lorenzo, Department of Tolima. General instruction is expected to be given in various branches of agriculture and allied sciences, including veterinary science, and courses will also be arranged for students who desire to specialize along certain lines. Particular attention will be paid to teaching students how to distinguish beneficial from injurious insects met with in practical agriculture. The government of the department of Antioquia has taken preliminary steps to establish a laboratory for the manufacture of vaccine to be used by stockmen in the prevention of murrain and similar diseases of cattle. A recent executive decree places the national meteorological service, established in 1917, under the department of public instruction.

The school of agricultural mechanics at Bahia Blanca, Argentina, which admits pupils of not less than 17 years of age, had an attendance of 32 in 1916. The shops of the school have been equipped with new machinery.

A Brazilian forestry service has been authorized, to be under the direction of the department of agriculture and to have for its object the conservation and improvement of forests and the regulation of all matters pertaining to them.

The department of agriculture of the Dominican Republic has provided a traveling agricultural instructor to recommend measures for obtaining more abundant yields of staple crops. An agricultural school under the direction of Dr. Emil Jeannot was recently organized at Charpentier, Haiti.

An agricultural experiment station of the coeducational schools of Amatitlan, Guatemala, recently began operations, the equipment having been donated by a philanthropic citizen of the community.

In Mexico a school of agriculture was opened in Hermosillo, the capital of the State of Sonora, in March, 1917, under the direction of the governor of that commonwealth. In the same month a national forestry school was inaugurated at Coyoacán, a suburb of the City of Mexico. The agricultural experiment stations in the States of Vera Cruz, Puebla, San Luis Potosi, Oaxaca, and Tabasco, have been supplied with modern machinery and appliances, as well as improved seeds, and instruction by experts will be given to farmers in these states. A publication entitled *Revista agricola* has been founded in the national capital.

An agricultural school has been established in the Department of Leon, Nicaragua, with Manuel Godoy as president. The government has also formulated a plan for a course of instruction in the new national school of agriculture, according to which there will be a section for the instruction of laborers or farm hands, a section for agriculturalists or farmers, and a section for agronomists or agricultural engineers. The governor of each povince is to select by competitive contests two boys, who have passed the fourth grade of primary instruction and are over 13 years of age, for entrance into this school at the expense of the State. A school for boys not over 16 years of age, who have studied agronomy for at least a year, was opened recently at Chinandega City, with an appropriation of $5,000 for its installation. It is equipped with up-to-date machinery and implements necessary for the proper cultivation of cereals

and other crops, and makes a specialty of teaching its pupils the practical use and advantages of machinery in agricultural operations.

The agricultural bank in Paraguay has established weather bureaus in the principal farming centers and proposes to compile statistics based on data obtained from these stations. The government of Uruguay has granted 10 scholarships in its agricultural school to young Paraguayans who desire to continue their studies in Uruguay.

A law recently enacted by the Peruvian Congress establishes an industrial school in the city of Iquitos. This school has an agricultural department and a department of arts and crafts, and is to be maintained from the proceeds of a tax on rubber shipped through the port of Iquitos and on the registered tonnage of vessels clearing from this port with cargoes for delivery to the port of Loreto. The course offered by each department is to extend over three years. The agricultural department is intended to fit students for trained work in the vast agricultural region of Peru, east of the Andes Mountains, much of which is as yet unexplored except in the immediate vicinity of navigable streams, and nearly all of which is virgin territory for the development of agriculture. The site of the agricultural department will be the Caucho Experimental Station in Iquitos. An executive decree of April 10, 1917, also provided for the reorganization of the national school of agriculture and veterinary science and the enlargement of its functions.

A recent executive decree in Salvador provides rules and regulations for the operation of the pathological-vegetable laboratory established under the governmental order of September 19, 1914, for the study of the diseases of plants and proper methods and remedies for preventing and combating them.

An executive decree in Uruguay places its agronomic stations under the immediate supervision and control of the Department of Fomento. At the suggestion of the park commission of Montevideo, a school for gardeners has been established in the national capital for the purpose of supplying special skilled labor of this kind.

The Uruguay national nursery at Toledo is furnishing a large number of trees for planting operations. A recent decree prescribes that persons owning not less than 100 hectares of land shall be supplied gratis with 100 trees, and it is estimated that 100,000 trees will be distributed annually in this way. The nursery referred to will also donate to rural communities, schools, police farms, etc., 100,000 trees during the present year and 200,000 trees yearly thereafter. For the purpose of increasing the cultivation of flax, which has considerably decreased during the last few years, the president of the Republic has issued a decree requiring expert agronomists at the Estanzuela nursery, as well as those at the agricultural stations at Salto, Paysandu, and Cerro Largo, to investigate and report on the different kinds of flax grown in these regions.

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U. S. DEPARTMENT OF AGRICULTURE

STATES RELATIONS SERVICE

A. C. TRUE, DIRECTOR

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EXPERIMENT STATION RECORD.

VOL. 38. ABSTRACT NUMBER. No. 3

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

On the origin of the humin formed by the acid hydrolysis of proteins.—III, Hydrolysis in the presence of aldehydes.—II, Hydrolysis in the presence of formaldehyde, R. A. GORTNER and G. E. HOLM (*Jour. Amer. Chem. Soc., 39 (1917), No. 11, pp. 2477–2501, fig. 1*).—Continuing the work previously noted (E. S. R., 36, p. 108) the authors, at the Minnesota Experiment Station, have studied the reactions which take place when proteins are hydrolyzed in the presence of formaldehyde, with special reference to the formation of the black insoluble humin of protein hydrolysis and also, incidentally, to the composition of the "soluble humin" and "ammonia" fractions.

From the results it is concluded that "when proteins are hydrolyzed in the presence of trioxymethylene and the resulting hydrolyzate analyzed by Van Slyke's method, the nitrogen distribution is so altered as to bear no resemblance to the analysis conducted in the absence of aldehyde. When a protein containing tyrosin and trytophan is hydrolyzed with increasing amounts of trioxymethylene, the figures for both insoluble and soluble humin nitrogen are rapidly increased to a maximum, after which there is a sharp decrease in the nitrogen curve of these fractions. The ammonia fraction, on the other hand, decreases with the smaller additions of trioxymethylene and then rises rapidly for larger additions of aldehyde. When both tyrosin and tryptophan are absent from a protein, hydrolysis in the presence of trioxymethylene produces no change in the insoluble or soluble humin nitrogen and only a steady increase in the ammonia fractions. We have shown that the rise in the insoluble humin curve and the formation of black insoluble humin is due to the presence of tryptophan in the hydrolyzate, and we believe that the maximum point on the insoluble humin nitrogen curve coincides closely with the amount of tryptophan nitrogen present in the hydrolyzate. An excess of trioxymethylene largely inhibits the formation of insoluble humin but does not break down insoluble humin which has once been formed."

Histidin and cystin were found not to be involved in the formation of black insoluble humin as reported by Roxas (E. S. R., 36, p. 412), and it is believed that tryptophan alone of all the hydrolytic products is involved in the reaction, as previously reported by the authors. The formation of the humin is indicated as being due to a combination of tryptophan with some unidentified aldehyde or ketone, and the only part which any of the other amino acids have in the humin formation is probably to furnish some of their nitrogen, either through adsorption or occlusion. "The α-amino group of the aliphatic side chain of tryptophan is not involved in the primary reaction by which black insoluble humin is formed. The primary reaction concerns only the indol

nucleus, inasmuch as the same reaction takes place when tryptophan is replaced by indol and it appears probable that it is the α-position of the indol nucleus which is reactive.

"The soluble humin nitrogen of proteins hydrolyzed in the presence of trioxymethylene is largely derived from tyrosin. However, the maximum point of the soluble humin curve includes some tryptophan nitrogen. We believe that it is possible to distinguish the soluble humin formed from tryptophan from that derived from tyrosin, for there is a sudden drop from the maximum insoluble humin nitrogen when additional aldehyde is added and then, on the further addition of aldehyde, the curve flattens and becomes approximately a straight line. The sudden drop we believe to be due to the nonformation of soluble humin from tryptophan due to the presence of an excess of aldehyde and the straight line drop to the deamination of the tyrosin humin. If this be true an extension of the deamination curve until it intercepts the rising soluble humin curve should indicate the proportion of the soluble humin nitrogen due to tyrosin. The sudden initial drop in the ammonia fraction is probably due to the removal of some compound (tryptophan) in the insoluble humin which, when no aldehyde is present, contributes nitrogen to the 'ammonia' fraction. The sudden rise in the 'ammonia' curve with larger additions of trioxymethylene is not due to the formation of ammonia but to the deamination of amino acids and the formation of volatile alkaline compounds, the nature of which is still under investigation."

The identity of cyanuric acid with so-called "tetracarbonimid," E. H. Walters and L. E. Wise (*Jour. Amer. Chem. Soc., 39 (1917), No. 11, pp. 2472–2477*).—Data are submitted which show that the so-called "tetracarbonimid" which has been prepared by oxidizing uric acid with hydrogen peroxid in alkaline solution is really cyanuric acid. The nitrogenous compound isolated from a number of soils and at first believed to be tetracarbonimid has been shown to be cyanuric acid.

The further isolation of cyanuric acid from a number of sandy soils from different localities in Florida, Norfolk sandy loam from Virginia, lawn soil from the grounds of the U. S. Department of Agriculture, Elkton silt loam from Maryland, Scottsburg silt loam from Indiana, Caribou loam from Maine, and a Susquehanna fine sandy loam from Texas is noted. From these results it appears that the acid or its precursor is widely distributed in soils.

See also a previous note (E. S. R., 37, p. 612.)

The isolation from peat of certain nucleic acid derivatives, W. B. Bottomley (*Proc. Roy. Soc. [London], Ser. B, 90 (1917), No. B 623, pp. 39–44*).—From the results of the investigation the author concludes that "all the constituents of a true nucleic acid are present in raw peat, but nucleic acid as such has not been isolated. Nucleic acid must have been present in the plants from which peat has been formed, and since it is improbable that hydrolysis could have been brought about by the methods of extraction employed, the original nucleic acid has evidently been decomposed by bacterial or other agencies during the process of peat formation into the products which have been isolated." The probable course of the decomposition of the nucleic acid in peat is briefly discussed.

The work reported was only qualitative, but it is indicated that a quantitative study is in progress. The analytical procedures used are described in detail.

Fats from Rhus laurina and R. diversiloba, J. B. McNair (*Bot. Gaz., 64 (1917), No. 4, pp. 330–336, fig. 1*).—The following constants were obtained for the substances isolated from *R. diversiloba* and *R. laurina*, respectively: Spe-

cific gravity at 18.5° C., 0.9872 and 0.8987; solubility, milligrams per liter in 95 per cent alcohol at 20°, 170 and 136; Hübl iodin absorption, 8.79 and 11.44 per cent; saponification value, 220.6 and 157.1; and melting point, 53 and 74°.

The substances are indicated as being more similar to Japan wax than to any other fat. A decrease in the poisonous properties of the fruit of *R. diversiloba* was found to occur simultaneously with an increase in its fat content. "The decrease in the poisonous properties in the ripening of the fruit of *R. diversiloba* eventually results in the fruit becoming nontoxic. This phenomenon is not necessarily due to a chemical transformation of the poison into fat, for (1) subsequent to the formation of fat the cells in which it is deposited become filled with starch; (2) it is possible for the plant to transform starch into fat; (3) fat is not formed in the parenchymatous sheaths of the resin passages; (4) consequent upon the formation of fat, the resin passages are everywhere constricted by the growth of parenchyma sheaths; (5) a similar fat has been found in the fruit of a nonpoisonous species of Rhus."

A graphical chart showing the time when and the number of birds that eat poison-oak fruits is included.

The composition of loganberry juice and pulp, M. R. DAUGHTERS (*Jour. Indus. and Engin. Chem., 9 (1917), No. 11, p. 1043*).—The following results were obtained in the examination of three samples of loganberry juice: Specific gravity (16° C.), 1.0523, 1.0477, 1.0508; percentage of acidity as citric, 2.396, 3.084, 2.199; percentage of acidity as sulphuric, 1.678, 2.159, 1.54; water, 88.96, 89.13, 90.548; total solids, 11.04, 10.87, 9.452; percentage of ash, 0.4139, 0.5785, 0.4226; alkalinity (as K_2CO_3), 0.413, 0.5075, 0.288; protein (N × 6.25), 0.3226, 0.731, 0.7375; sugar (as invert sugar), 6.56, 5.37, 8.39; alcoholic precipitate, 0.502, 0.872, 0.4008; calorific value per liter, 290, 207, 385. The percentage composition of the moist and dried loganberry pulp, respectively, was found to be, moisture, 70.97; total solids, 29.03; protein (N × 6.25), 3.727 and 12.81; ether extract, 3.799 and 13.089; nitrogen-free extract, 11.06 and 38.11; crude fiber, 8.389 and 28.89; ash, 0.695 and 2.394; acid (as citric), 1.367 and 4.706; calories (per pound), 426 and 1.458.

The oil obtained yielded the following constants: Specific gravity (15.5°), 0.926; refractive index (15.5°), 1.4811; solidifying temperature, —33°; iodin number, 158.32; saponification number, 179.8. The oil is indicated as lying between hempseed oil and tung oil as a drying oil.

Summary of the composition of wines of current consumption, G. FILAUDEAU (*Ann. Falsif., 10 (1917), No. 105–106, pp. 321–405*).—These pages contain data for the various wines of the harvest of 1916 (E. S. R., 37, p. 12).

A new form of safety pipette, A. S. BEHRMAN (*Jour. Indus. and Engin. Chem., 9 (1917), No. 11, p. 1047, figs. 2*).—A device which consists of an ordinary pipette or a Mohr pipette, used in conjunction with a three-way stopcock, and a stiff atomizer bulb properly valved is described.

A convenient automatic device for rapidly washing pipettes, A. V. FULLER (*Jour. Indus. and Engin. Chem., 9 (1917), No. 11, pp. 1046, 1047, fig. 1*).—The construction and operation of a convenient apparatus are described by a diagram.

An asbestos stopper, J. B. NICHOLS (*Jour. Indus. and Engin. Chem., 9 (1917), No. 11, p. 1047*).—The author describes the preparation of an asbestos stopper which was used in a distillation which involved the use of fuming sulphuric acid at a temperature of about 350° C. A plaster of Paris mold was made of a suitable cork, and then tamped with a mixture of asbestos-magnesia mixture (as used for steam packing) and long-fibered asbestos. After proper drying the stopper was found to be just plastic enough to be firmly pressed into the

neck of the flask, and although it became hard during the distillation could be removed without difficulty. By moistening again it could be used for a second distillation.

An accurate method for taking aliquots of a standard in standardizing solutions, C. F. Miller (*Jour. Amer. Chem. Soc., 39 (1917), No. 11, p. 2388*).—The following method is proposed:

About five times as much of the standard as is desired for the titration is carefully weighed and dissolved in a quantity of water slightly exceeding five times the capacity of the pipette to be used in taking the aliquots. Five portions of the solution are then carefully drawn in an identical manner, and the remainder, together with the rinsings from the pipette, is transferred to a tared platinum dish, evaporated, dried, and weighed. The pipette need not be standardized nor its exact capacity known. A simple calculation gives the amount of material in each aliquot.

The method can be used only for such substances as sodium carbonate, sodium oxalate, etc., which are soluble and separate from the solution again in a weighable form upon evaporation.

The nomon—a calculating device for chemists, H. G. Deming (*Jour. Amer. Chem. Soc., 39 (1917), No. 10, pp. 2137–2144, figs. 2*).—The author describes the use of a calculating chart which he has devised and which has a degree of precision about five or ten times that of an ordinary 10-in. slide rule. Special scales can be easily constructed to adapt the chart for varied calculations.

Observations on the McLean-Van Slyke iodometric method for the titration of small amounts of halids, in its application to chlorids, R. F. McCracken and Mary D. Walsh (*Jour. Amer. Chem. Soc., 39 (1917), No. 11, pp. 2501–2506*).—The authors have found that when a titration is made very slowly in the McLean-Van Slyke method[1] a starch-iodid color that might be mistaken for the end point sometimes develops before the titration is complete. This color gradually disappears as the end point is approached, even when several times as intense as the end point color. By supplementing the starch present in the titration with 10 cc. of a 1 per cent soluble starch solution just before titration, the end point is obtained in a clear solution instead of an opalescent solution.

Both the original method and the method with the use of additional starch, as noted above, are indicated as giving satisfactory results.

Determination of chlorin in blood serum and albuminous body fluids, M. Laudat (*Jour. Pharm. et Chim., 7. ser., 16 (1917), No. 6, pp. 168–171*).—In the titration of chlorin after oxidation with nitric acid the development of the yellow color during the action of the nitric acid on the protein was found to interfere with obtaining a sharp end point and consequently caused slightly low results. The use of potassium permanganate was found to eliminate this source of error and the following procedure was developed:

To 5 cc. of the serum or other sample 10 cc. of tenth-normal silver nitrate, 6 cc. of a saturated solution of potassium permanganate, and 10 cc. nitric acid (specific gravity 1.38) are added and the mixture carefully heated for several minutes. After cooling, the liquid is made up to 100 cc. volume and the excess silver nitrate titrated with tenth-normal potassium sulphocyanate, using ferric alum as indicator. It is noted that the procedure requires but five or six minutes for completion, and yields accurate results as shown by comparative data.

The colorimetric determination of manganese by oxidation with periodate, H. H. Willard and L. H. Greathouse (*Jour. Amer. Chem. Soc., 39 (1917), No. 11, pp. 2366–2377*).—A method based on the equation

$$2Mn(NO_3)_2+5KIO_4+3H_2O=2HMnO_4+5KIO_3+4HNO_3$$

[1] Jour. Amer. Chem. Soc., 37 (1915), No. 5, pp. 1128–1134.

has been devised and is described. The general procedure is to bring the material to be analyzed into a solution containing in 100 cc. at least from 10 to 15 cc. concentrated sulphuric acid, 20 cc. of nitric acid or from 5 to 10 cc. of sirupy phosphoric acid, or mixtures of two or more of the acids. The solution must be previously freed from reducing agents by boiling with nitric acid, adding a little persulphate if carbon compounds are present. If chlorids are present the solution should be evaporated with nitric and sulphuric acids. From 0.2 to 0.4 gm. of potassium or sodium periodate is added, the solution boiled for a minute, kept hot from five to ten minutes, cooled, diluted to the proper volume, and compared with a standard of known manganese content, similarly prepared. The solution, when ready to be compared, should not contain much more than 1 mg. of manganese per 50 cc., as otherwise the color would be too dark. In the presence of considerable iron either sulphuric or phosphoric acid must be present, since the ferric periodate is insoluble in concentrated nitric acid but readily soluble in other acids.

The method is indicated as being specially adapted for the determination of manganese in water, soil, ores, and other materials in which it is present in small amounts.

An attempt to use the reaction as a basis of a volumetric method was unsuccessful.

A bibliography of 34 references to the literature on the colorimetric determination of manganese is appended.

Some suggestions concerning the preparation of ammonium citrate solution and the determination of insoluble phosphoric acid, P. McG. Shuey (*Jour. Indus. and Engin. Chem., 9 (1917), No. 11, p. 1045*).—The author notes that he has found that the neutral point in the preparation of ammonium citrate by the addition of ammonium hydroxid to citric acid can be reached at once by calculating the amount of ammonia required for a given amount of citric acid according to the following equation:

$$C_3H_4OH(COOH)_3+3NH_3=C_3H_4OH(COONH_4)_3.$$

Practical examples of the preparation of ammonium citrate solution and some notes on its use for determining soluble phosphoric acid in various materials are included.

The determination of soil phosphorus, C. O. Rost (*Soil Sci., 4 (1917), No. 4, pp. 295–311*).—In the study reported the author, at the Minnesota Experiment Station, compared the fusion with sodium carbonate method, the Fischer and Hilgard (E. S. R., 15, p. 746) methods, involving extraction with strong acid, the Washington hydrofluoric acid method, a modification of Washington's method proposed by Robinson (E. S. R., 34, p. 806), and a modification proposed by himself for the determination of phosphorus in soils. The author's modification of Washington's method provides for the elimination of the organic matter of soils and the complete extraction of the phosphorus by means of hydrofluoric and nitric acids. The procedure is described in detail.

The results of the comparative study show that only a negligible quantity of phosphoric acid was recoverable from the separated silica with the fusion method. Neither evaporation with magnesium nitrate previous to ignition nor precipitation of the phosphoric acid with the sesquioxids of iron and aluminum in order to separate it from the excess of sodium salts was found advantageous.

"The Fischer method recovered practically all of the phosphoric acid in the peat soils, but in most cases with mineral soils a considerable amount was left in the insoluble residue. None was lost by volatilization or rendered unrecoverable by the formation of compounds of iron and aluminum insoluble in

nitric acid. That left in the residue was the result of an incomplete extraction by the acids employed." In one soil the Hilgard method extracted as much acid-soluble phosphoric acid as did the Fischer method, but in another sample considerably less.

"Washington's method, when applied to soils and modified to the extent of igniting the residue to dull redness after the final evaporation with nitric acid, failed to recover the whole of the phosphoric acid present. The residues upon being fused with sodium carbonate yielded the missing amount, thus showing that the low percentages found by this method are not due to volatilization during ignition but to incompleteness of extraction by nitric acid.

"Robinson's modification of Washington's method extracted only from 50 to 65 per cent of the total phosphoric acid, the remainder being found partly in the residue and partly in the filtrate from the yellow precipitate. With soils high in organic matter the magnesium pyrophosphate obtained by this modification of the method carried a considerable amount of magnesium oxid, which was derived from precipitated organic compounds. A temperature so low that no glowing was produced failed to oxidize the organic matter completely. Samples analyzed by this modification of Washington's method, with the exception that after the first evaporation with nitric acid they were ignited to very dull redness, behaved similarly, although no phosphoric acid was found in the filtrate from the yellow precipitate." The incomplete extraction of the phosphorus from soils by Washington's method was found to be due to overheating of the residue, causing the formation of difficultly soluble phosphates or iron and aluminum.

The amount of titanium oxid found in soils is considered to be too low to interfere with the precipitation of the phosphorus.

The data are submitted in tabular form and discussed.

Rapid determination of bran contained in flour and bread, R. Legendre (*Ann. Falsif., 10 (1917), No. 105-106, pp. 293-296, fig. 1*).—The following procedure is described:

After determining the moisture in a 2-gm. sample of flour or a 3-gm. sample of bread crumbs, the material is treated in a test tube or other suitable container with 10 cc. of water and 10 cc. phosphoric acid (specific gravity 1.38) and the mixture heated in an autoclave for one hour at 120° C. After cooling, the contents of the tube are placed on a small, previously moistened silk sieve (number 100 or 120) and carefully washed with a small stream of water until the washings are clear. The bran on the sieve is returned to the tube, water added, and the mixture again returned to the sieve and washed. After being thoroughly washed it is collected, dried, and weighed. Where the method is used for spaghetti and similar products the time of heating should be prolonged.

The procedure is indicated as being sufficiently accurate for the detection of adulteration of either flour or bread.

Tentative standard methods for the sampling and analysis of commercial fats and oils, other than those of the coconut, butter, and linseed groups (*Jour. Indus. and Engin. Chem., 9 (1917), No. 11, pp. 1066-1070, fig. 1*).—The methods of sampling and analysis reported have been adopted by the committee on the analysis of commercial fats and oils of the Division of Industrial Chemists and Chemical Engineers of the American Chemical Society as tentative standards for the use of the trade pending their official adoption by the society.

Occurrence of manganese in insect flowers and insect flower stems, C. C. McDonnell and R. C. Roark (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 3, pp. 77-82*).—Tabular data relative to the manganese content of stems

and of "open" and "closed" flowers of *Chrysanthemum cinerariæfolium* of both Dalmatian and Japanese origin are submitted.

The manganese content of both stems and flowers was found to vary so much and the difference in amount to be so small in these two parts of the plant as to render valueless any method for estimating the amount of powdered stems in an insect powder from its manganese content.

The Japanese pyrethrum contained more manganese than that from other countries. This is indicated as being probably due to the high manganese content of the volcanic soils of Japan. An increase in the manganese content of pyrethrum was found to be accompanied by a slightly higher nitrogen and phosphoric acid content.

Potato utilization possibilities, H. C. Gore (*Proc. Potato Assoc. Amer., 3 (1916), pp. 70–75*).—This is a brief discussion of the manufacture of potato starch and dextrin and of potato drying, together with a method developed by the author for drying potatoes, practicable in small factories or on farms.

A preliminary report upon the making of potato silage for cattle food, L. A. Round and H. C. Gore (*Proc. Potato Assoc. Amer., 3 (1916), pp. 75–79*).—The authors have found that the use of from 2 to 5 per cent of corn meal mixed with crushed potatoes insures an acid fermentation which converts potatoes into a good silage. The process can be carried out on either a large or small scale, and with reasonable care the losses are negligible.

The potatoes should be first well washed and then properly crushed. The container in which the fermentation takes place must be tight and so covered as to exclude as much air as possible.

The resulting product is indicated as being very desirable and to be eaten freely by cattle. Although eaten less readily by hogs at first, they soon learn to eat it.

The market for sunflowers (*Rhodesia Agr. Jour., 14 (1917), No. 4, pp. 508–516*).—This is a brief report from the Imperial Institute of the United Kingdom, the Colonies, and India on utilization of and markets for sunflowers from Rhodesia.

It is noted that practically the only industrial purpose to which plant pith is applied at present is in the manufacture of pith helmets, and that for this purpose the sunflower pith appears to be less suitable than the others commonly used. This point, however, is being investigated further. The pith can not be employed as a substitute for wood and cotton in the preparation of cellulose on account of its low yield and physical condition. Its possible use as material for packing in the sheathing of ships and for stuffing life-saving appliances for use at sea is being investigated.

The material is considered unsuitable for use in feeding stuffs on account of its indigestibility and high absorptive capacity for fluids. Since no experimental work appears to have been done in this connection, it is indicated that feeding trials should be carried out. Its admixture with molasses is indicated as probably a suitable way of feeding the material.

After the removal of the pith from the stems a good yield of pulp is obtained which, however, is only suitable for the manufacture of common brown paper, since it can not be satisfactorily bleached. The best method of using the stems at present is indicated as being either to chop them for use as manure, since they contain nearly 5 per cent of potash, or to burn them and use the ash, which contains nearly 50 per cent of its weight of potash. The ash might also be employed for the extraction of crude potash as is now done in Russia.

Evaporated apples, C. S. McGillivray (*Canada Dept. Agr., Health Anim. Branch Bul. 24 (1917), pp. 38, figs. 33*).—This is a report on the evaporated apple industry in Canada. The general topics treated are different types and

equipment for evaporators, paring machines, bleachers, slicers, etc.; plans of evaporators; the curing room; and color, uniformity, cut, etc., of the finished product.

Canned foods, A. W. Bitting (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Misc. Ser., No. 54 (1917), pp. 79, figs. 39*).—This bulletin describes and discusses modern processes of commercial canning in the United States, the general system of grading, and products available for export.

Home and farm canning, W. V. Cruess (*California Sta. Circ. 158, rev. ed. (1917), pp. 32, figs. 10*).—In this revision (E. S. R., 36, p. 509), special directions for meats and some notes on ptomaine and botulinus poisoning and on new methods of sterilizing fruits and vegetables have been added.

For vegetables low in acidity, the addition of lemon juice and sterilization at 212° F. was found to sterilize the material completely, but not in any way to be injurious to its flavor or texture. Since heating fruits at 212° always changes more or less the flavor, texture, and appearance, experiments were carried out to determine the lowest temperature at which complete sterilization was effected. Temperatures of from 165 to 175° were found to be sufficient and to yield most satisfactory products.

A German substitute for jute (*Agr. Jour. India, 12 (1917), No. 1, pp. 159, 160*).—A material designated as "textilose" made from paper pulp which has passed through machines and been spun into thread or cord preparatory to weaving into a tough cloth is briefly noted. The material is reported as possessing remarkable wearing qualities and to be a creditable substitute for the natural fiber, though higher priced.

METEOROLOGY.

Relation between temperature and crops, D. A. Seeley (*Abs. in U. S. Mo. Weather Rev., 45 (1917), No. 7, pp. 354–359, figs. 3*).—Previous attempts to determine the relation between weather and crop production are reviewed, especially with reference to the methods employed.

Observations at East Lansing, Mich., during 1915 and 1916 on the temperature of the plant itself under varying atmospheric conditions are recorded. These show that the plant is much warmer than the air when bathed in sunshine, the excess in clear weather averaging about 15°, in partly cloudy weather, 10°, and in cloudy weather, less than 1° F. "Curves expressing plant growth rates and plant temperatures show parallelisms more decided than other temperatures observed, including maximum and mean air temperatures, soil temperatures, and readings of the 'black-bulb in vacuo.' A test of the number of heat units required to cause a cherry tree to blossom in the greenhouse and out of doors shows remarkably close results when plant temperatures are considered, but a consideration of air temperatures alone gives a wide variation.

"A formula is evolved for determining the effectiveness of air temperature in promoting crop development, as follows:

$$T=t+15C+10P,$$

t being the sum of maximum temperatures above 42° during a certain period, after that amount has been subtracted from each temperature, C being the number of clear, and P the number of partly cloudy days during the period."

A list of references to literature bearing on the subject is given.

Killing frost and length of growing season in various sections of Kentucky, F. J. Walz (*Kentucky Sta. Circ. 19 (1917), pp. 121–132, figs. 4; U. S. Mo. Weather Rev., 45 (1917), No. 7, pp. 348–353, figs. 4*).—This paper summarizes and presents in tables and charts the results of a study of the dates of

the last killing frost in spring and the first killing frost in fall in Kentucky. The average dates of frost, the average number of days in the growing season, and the "standard deviations" from these averages are computed for each station and consequent risks or probabilities determined.

Predicting minimum temperatures, J. W. SMITH (*U. S. Mo. Weather Rev., 45 (1917), No. 8, pp. 402–407*).—The importance of accurate methods of predicting mean temperatures in connection "with the development of orchard-heating methods and the protection of general fruit and garden crops from damage by frosts or low temperatures by heating, covering, or flooding" is pointed out. The methods used for this purpose are discussed.

A brief historical note by C. F. Marvin is appended.

Some field experiments on evaporation from snow surfaces, F. S. BAKER (*U. S. Mo. Weather Rev., 45 (1917), No. 7, pp. 363–366, figs. 2*).—Observations at the Utah Forest Experiment Station in the Manti National Forest indicated an evaporation of about 3 in. during the winter of 1915–16 out of a snowfall equivalent to 21.91 in. of water.

Mean annual rainfall of the United States, R. DEC. WARD (*U. S. Mo. Weather Rev., 45 (1917), No. 7, pp. 338–345, pl. 1, fig. 1*).—The purpose of this paper, which is based largely upon a new chart of average annual precipitation prepared by the Weather Bureau, is to present a clear, simple statement of essential facts regarding the rainfall of the United States from a broadly geographical rather than strictly meteorological point of view. The article discusses rainfall maps in general and the precipitation chart referred to in particular, and summarizes the essential features of rainfall in the eastern and Gulf provinces, the Great Plains, plateau provinces, and the Pacific coast. A list of special and general references to literature bearing on the subject is given.

Damage by hail in Kansas, S. D. FLORA and C. L. BUSH (*U. S. Mo. Weather Rev., 45 (1917), No. 7, pp. 359–361, figs. 2*).—A study of the extent and distribution of damage by hail, briefly reported in this article, indicates that the probability of damage from this cause increases toward the western portion of Kansas, although both the average rainfall and the rainfall for the crop-growing months in the western third of the State are less than half the averages for those periods in the eastern third. The causes of this increase in liability to damage by hailstorms in the drier, western part of Kansas remain to be determined.

Monthly Weather Review (*U. S. Mo. Weather Rev., 45 (1917), Nos. 7, pp. 335–395, pls. 9, figs. 18; 8, pp. 397–438, pls. 10, figs. 7*).—In addition to weather forecasts, river and flood observations, and seismological reports for July and August, 1917; lists of additions to the Weather Bureau Library and of recent papers on meteorology and seismology; notes on the weather of the months; solar and sky radiation measurements at Washington, D. C., during July and August, 1917; condensed climatological summaries; and the usual climatological tables and charts; these numbers contain the following articles:

No. 7.—Mean Annual Rainfall of the United States, with Notes on the New Chart of Average Annual Precipitation (illus.), by R. DeC. Ward (see above); Sea Breeze on Eastern Long Island (illus.), by E. S. Clowes; Influence of the Sea on the Climate of Long Island, N. Y., by E. S. Clowes; Killing Frost and Length of Growing Season in Various Sections of Kentucky (illus.), by F. J. Walz (see p. 208); Relation between Temperature and Crops (illus.), by D. A. Seeley (abs.) (see p. 208); Damage by Hail in Kansas (illus.), by S. D. Flora and C. L. Bush (see above); Scarf Clouds (illus.), by C. F. Brooks; Some Field Experiments on Evaporation from Snow Surfaces (illus.), by F. S.

Baker (see p. 209); Dark Day in Jamaica; and Distance at Which Thunder Can Be Heard, by C. E. Miller.

No. 8.—Aurora of August 21, 1917, by D. F. Manning; Aurora of August 25, 1917, at Washington, D. C., by I. F. Hand and C. Abbe, jr.; Parhelia 90° from the Sun Seen in Jamaica (illus.), by M. Hall (reprinted); Magnetic Storm of August 26–27, 1916, by W. E. W. Jackson (reprinted abs.); Comparison of Callendar Sunshine Recorder and Ångström Pyrheliometer, by J. Patterson (reprinted abs.); Penetrating Radiation in the Atmosphere, by G. C. Simpson (reprinted abs.); Meteorology and Aviation, by W. H. Dines (abs.); Predicting Minimum Temperatures (with a historical note by C. F. Marvin), by J. W. Smith (see p. 209); The Lowest Air Temperature at a Meteorological Station, by B. Galitzin (Golitsyn); Notes on the Hot Wave in Southern California, June 14–17, 1917 (illus.), by F. A. Carpenter; Changes in Weather Bureau Program of Meteorological Observations, by A. J. Henry (abs.); The Weather Bureau and the War, by E. B. Calvert (abs.); Normal Anomalies of Mean Annual Temperature Variations, by H. Arctowski (reprinted abs.) (E. S. R., 37, p. 417); Structure of Hailstones of Exceptional Form and Size, by F. E. Lloyd (reprinted abs.); Improved Methods in Hygrometry, by A. N. Shaw (reprinted abs.) (E. S. R., 37, p. 16); Factors Influencing the Condensation of Aqueous Vapor in the Atmosphere, by A. Masini (reprinted abs.) (E. S. R., 37, p. 716); Evaporation of Mercury Droplets Suspended in a Gas, by A. Schidlof and A. Karpowicz (reprinted abs.); Evaporation and Absorption, by A. Schidlof (reprinted abs.); Dynamics of Revolving Fluids, by Lord Rayleigh (reprinted abs.); and A Quintette of Cold Waves in Florida (illus.), by A. J. Mitchell.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and H. B. Millard (*Massachusetts Sta. Met. Buls. 345–346 (1917), pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during September and October, 1917, are presented. The data are briefly discussed in general notes on the weather of each month.

SOILS—FERTILIZERS.

Some notes on the direct determination of the hygroscopic coefficient, F. J. Alway, M. A. Kline, and G. R. McDole (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 4, pp. 147–166*).—This reports investigations conducted at the Nebraska Experiment Station from 1910 to 1913, on the development of a method for the direct determination of the hygroscopic coefficient in soils, earlier studies (E. S. R., 20, p. 714) having led to such modifications of Hilgard's method (E. S. R., 15, p. 746) as would permit a large number of determinations being made rapidly without loss of accuracy. Observations were made upon the influence of the material of the trays, time of exposure, temperature, grinding, and various other factors. Tabulated data are presented and discussed for each point studied.

The conclusions reached were that "the amount of hygroscopic moisture absorbed increases with the rise of temperature. Drying of mineral soils at temperatures of 100 to 110° C. does not appreciably decrease their hygroscopicity. Intractable samples may be reduced in a steel mortar to pass a 1-mm. sieve without appreciably affecting their hygroscopicity. Twelve hours' exposure in the absorption boxes is sufficient only when the soil layer is very shallow. In practice a longer interval is found more convenient, 20 to 24 hours proving very satisfactory. An exposure of more than 24 hours gives higher values in the case of only very fine textured soils.

"A soil containing the amount of moisture corresponding to its hygroscopic coefficient loses water very rapidly when exposed to an ordinarily dry atmosphere, but in determining the hygroscopic coefficient the time necessary to transfer the soils from the absorption boxes to weighing bottles is so brief that the loss during the transfer is too small to affect appreciably the accuracy of the results.

"Hilgard's method for the determination of the hygroscopic coefficient, carried out exactly as he described it, gives reliable results. However, the loose sheets of glazed paper thus involved are very inconvenient when many determinations are to be made and may advantageously be replaced by shallow trays, either of aluminum or of copper. . . . Any considerable increase in the size of the absorption boxes over that recommended by Hilgard or the use of a larger number of exposed samples within the boxes of the same size cause too low results, unless the time of exposure be greatly increased."

A bibliography of 27 titles is appended.

Some factors affecting nitrate-nitrogen accumulation in soil, P. L. Gainey and L. F. Metzler (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 2, pp. 43–64*).—The authors report the results of extensive investigations at the Kansas Experiment Station to ascertain the influence upon nitrate-nitrogen accumulation in soils of variations in some of the more important factors controlling aeration.

In preliminary experiments, variations in the quantity of soil amounting to from 50 to 1,000 gm. had little if any effect upon nitrification. Variations in the depth of columns of loose soil of from 0.25 to 20 in. did not produce appreciable differences in nitrification provided the soil was left loose, and nitrification was apparently no less vigorous 20 in. below the surface than at the surface. Packing the soil in a thin layer was without effect, but upon increasing the depth of column packing (reducing the volume from 14 to 9) resulted in a marked decrease in nitrate accumulation, the latter becoming negative only a few inches below the surface. A decrease in the ratio of surface exposed per 100 gm. of soil of from 314 sq. cm. to 2 sq. cm. had no effect upon nitrification. The shape and size of the container and methods of preventing evaporation and contamination were without effect except when the container was tightly stoppered and when the volume of inclosed air was relatively small in proportion to the soil volume.

These observations led to more detailed experiments of the effect upon nitrification of variations in depth of column and compactness of soil; of depth of column, moisture content, and compactness; of soil in sealed containers as compared with a soil surface exposed to the atmosphere; and of unbroken soil columns as compared with broken columns. The data are tabulated, discussed in some detail, and available experimental data reported by other investigators relative to the influence of different degrees of aeration upon nitrate formation briefly reviewed.

The authors conclude that "as the moisture content of a soil decreases, increasing the compactness from a very loose condition will increase the accumulation of nitrate nitrogen. With any degree of compactness tested the optimum moisture content will be reached when the soil contains approximately two-thirds the total amount of moisture it will retain. Aeration will be sufficient to the depth of 1 ft. with any degree of compactness, provided the moisture content does not exceed the above relation.

"Increasing the depth of column up to 2 ft. does not, as far as tested, alter the above relations. In fact, the accumulation of nitrate nitrogen increases with increasing depth down to 2 ft., so long as the moisture does not exceed approximately two-thirds saturation. Nitrate nitrogen accumulates more

rapidly in unbroken soil columns than in pulverized soil. Aeration in a column of soil uncultivated for seven years is far in excess of that required to maintain aerobic conditions.

"It has also been pointed out that such experimental data as are available, regarding oxygen relations in normal field soils, indicate that obligate aerobic conditions almost universally exist within the first foot of surface. Therefore such beneficial effect as cultivating may have upon biological activity can not be attributed to increased aeration."

A comparative study of the nitrogen economy of certain Tennessee soils, C. A. Mooers (*Tennessee Sta. Bul. 118* (*1917*), *pp. 125–187, figs.* 7).—This reports the results of extensive pot experiments conducted during the 5-year period of 1909 to 1914, inclusive, with four distinct soil types designated as Cookeville, Crossville, Gallatin, and Jackson. The principal factors considered were (1) the comparative utilization of nitrogen by crops on different soils with regard to the nitrogen naturally present and that supplied by sodium nitrate and farm manure; (2) the losses of soil and subsoil nitrogen under different conditions, including cropped and uncropped, limed and unlimed, and manured and unmanured soils; and (3) indications of nitrogen assimilation from the air independent of legumes. Each soil type was removed in layers as found in the field. transported to Knoxville and placed in 4-ft. cylinders sunk in the ground, each cylinder inclosing a surface area of approximately $\frac{1}{10,000}$ acre. The cylinders were fully exposed to the weather, but protected from birds by a screen cage. No artificial watering was given. Ten successive crops were planted in each of 69 cylinders, the remaining 31 cylinders being kept bare. Oats were grown the first season, followed by wheat four seasons. Millet followed each of the small-grain crops in the summer. The limestone and manurial treatments were moderate and well within the limits of farm practice. Considerable tabulated data are presented and discussed from both the crop and soil standpoint. The results are summarized as follows:

"The largest crops were produced by the Gallatin soil, which had decidedly the highest content of total nitrogen, but the yields decreased very rapidly in the course of the five years. The second largest yields were obtained from the Jackson soil, which had the lowest nitrogen content—only a little more than one-third of that of the Gallatin soil. The Jackson soil, however, maintained a more constant yield than any other, and in the last two years the crop equaled those from the Gallatin soil. The Cookeville and Crossville soils proved to be the least productive, and were practically on an equality in this respect. For the Cookeville and Crossville soils constancy of yield was obtained only on the limed cylinders. The results given by the 10 limed and cropped cylinders of each of the four types were used, therefore, in determining the percentage of nitrogen recovery from manurial applications and in certain other calculations.

"The recovery by crops of the nitrogen applied in the form of sodium nitrate varied with the kind of soil as follows: Cookeville 45.38, Crossville 53.71, Gallatin 87.08, and Jackson 72.21 per cent. The results are correlated with the productiveness of the soils; that is, the more productive the soil the greater the root development to intercept the nitrate—the greater the percentage of nitrate nitrogen recovered.

"The recovery by crops of nitrogen from the organic materials—manure and manure plus straw—varied with the kind of soil as follows: Cookeville 29.82, Crossville 34.52, Gallatin 37.58, and Jackson 23.88 per cent. The results are correlated with the physical nature of the soils; that is, the more open and porous soils show the highest recovery.

"The ratio between the nitrogen content and the dry matter of the crops varied little in the three soils—Cookeville, Crossville, and Gallatin—which averaged 93.11 gm. of dry substance per gram of nitrogen. The crops from the Jackson soil, however, gave a ratio of 120.01 gm. of dry substance per gram of nitrogen. A low nitrogen content was found to characterize alike the grain and the straw of the wheat, also the millet hay from the Jackson soil.

"In every instance the cropped soils maintained a decidedly higher nitrogen content than the uncropped. This difference was noticeable both in the surface soil and in the first 6 in. of the subsoil, but the results from the 12- to 24-in. depth were inconclusive. The losses of nitrogen from the surface soils under comparable conditions were as follows: Cropped, Cookeville 2.1, Crossville 1.2, Gallatin 12.4, and Jackson 0.4 per cent; and uncropped, Cookeville 6.8, Crossville 6.2, Gallatin 18.2, and Jackson 4.2 per cent. The average combined saving in surface soil and subsoil nitrogen for the three most representative types—Cookeville, Crossville, and Gallatin—was 8.4 mg. per gram of air-dry crop, or 9.3 mg. per gram of dry substance harvested.

"In uncropped experiments surface soil treated with ground limestone showed appreciable loss of nitrogen as compared with untreated. Under cropping, however, three of the four soils showed more nitrogen at the end of the 5-year period in the limed cylinders than in the unlimed. This result is attributed to the offsetting of the direct loss through liming by the conservation of nitrogen brought about through increased crop production. The effect of applications of acid phosphate and muriate of potash on the content of soil nitrogen was not appreciable under cropping. No experiments were made under uncropped conditions.

"Where no crops were grown, top-dressings of nitrate of soda resulted in a small but evident loss of soil nitrogen. Under cropping the nitrated cylinders showed a greater supply of both soil and subsoil nitrogen than the unnitrated, the difference being slight for the soil but more pronounced for the subsoil. This result, as in the case of the ground limestone, is attributed to the more than balancing of the direct loss through nitrating by the conservation of nitrogen brought about through increased crop production.

"Manure applied to the surface soil of uncropped cylinders did not increase the nitrogen content of the subsoil. Under cropping the nitrogen content of the subsoils from the manured cylinders averaged somewhat higher than that from the unmanured; that is, manure applied to the surface soil conserved the supply of nitrogen in the subsoil.

"If the loss of nitrogen from both the soil and subsoil be considered, the loss from the Cookeville, Crossville, and Gallatin soils was in each case greater than can be accounted for in the crops removed. In the case of the Jackson soil, however, this was not so, the subsoil showing a moderate loss but the surface soil of the cropped cylinders a slight gain.

"The Jackson soil, which gave in many respects decidedly different results from any other, is noted as the only one to give evidence of the fixation of atmospheric nitrogen to a marked extent. To attribute this nitrogen accumulation to other exterior sources was considered untenable.

"The general conclusion is drawn that not only the cropping but also the manurial treatments conserved both the soil and the subsoil nitrogen to a total depth of about 1 ft., directly in proportion to the crop increase. This conservation does not, of course, prevent a loss of soil nitrogen through either chemical or biological processes induced per se by an applied substance such as ground limestone. In such a case the two opposing factors may or may not balance each other. Since cover crops are often advocated because they catch soluble nitrogen that would otherwise be lost by leaching, attention may be called to

the fact that the conservation referred to is not limited to the nitrogen utilized by the crops and conserved in the crop residues, but is an additional and actual conservation of soil nitrogen which may be utilized by farm crops."

The chemical composition of the soils of the Freehold area in New Jersey, A. W. Blair and H. C. McLean (*New Jersey Stas. Bul. 309 (1916), pp. 5–37*).—This reports chemical analyses of 31 soil types of seven series and of one sample of muck from the Freehold area of New Jersey, described and mapped by the Bureau of Soils of the U. S. Department of Agriculture (E. S. R., 34, p. 616).

The analyses show rather certain pronounced chemical differences between soils of the different series, but a measure of similarity between soils of a particular type, if that type is followed through the various series. Generally speaking, the soils containing the highest percentage of total plant food are the most productive. The total plant food increases from the lighter to the heavier types, with few exceptions. There is invariably more nitrogen and carbon in the soil than in the subsoil; in the case of nitrogen at least three times as much. There is little difference in the average mineral content of the soil and subsoil, although in many cases there is slightly more potash in the subsoil than in the soil. In most types magnesia is somewhat in excess of lime in both soil and subsoil. Practically all of the soils are deficient in active lime, the lime being mainly in the form of silicates or phosphates. In the majority of cases the lime requirement was from 1,000 to 3,000 lbs. of ground limestone or its equivalent in lime.

Soil survey of Washington County, Ala., L. A. Hurst, E. H. Stevens, H. C. Smith, J. L. Andress, and J. F. Stroud (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1915, pp. 51, pls. 4, fig. 1, map 1*).—This survey, made in cooperation with the State of Alabama, deals with the soils of an area of 684,800 acres in southwestern Alabama, lying wholly within the Gulf Coastal Plain province. The topography of the county varies from low, flat first-bottom lands and level terraces to undulating upland and eroded hills, the elevation ranging from sea level to 300 or 400 ft. above.

The soils of the county are derived from sediments from crystalline, limestone, and sandstone and shale areas of the Appalachian, Piedmont, and Limestone Valley regions, and occur both as sedimentary and as alluvial soils. Twenty-seven soil types of 16 series are mapped in addition to swamp and muck, Plummer fine sandy loam occupying 21.6 per cent, Norfolk fine sandy loam 14.4 per cent, and swamp 11.2 per cent of the total area, predominating.

Soil survey of the Honey Lake area, Cal., J. E. Guernsey, J. Koeber, C. J. Zinn, and E. C. Eckmann (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1915, pp. 64, pls. 4, fig. 1, map 1*).—This survey, made in cooperation with the California Experiment Station, deals with the soils of an area of 338,560 acres in the southeastern part of Lassen County, Cal., the topography of which is varied, ranging from level on the valley floor to rough mountainous in the foothills.

"The soils are classed under seven general groups (1) those derived from residual material, (2) those derived from old valley-filling material (chiefly Lahontan Lake beds), (3) those derived from material of the Lahontan beds modified by chemical precipitates, (4) those derived from recent lake deposits, (5) those derived from recent alluvial fan and stream-bottom deposits, (6) those derived from wind-laid deposits, and (7) miscellaneous material. In extent the old valley-filling soils are by far the most important, but are not extensively utilized. The recent lake-laid soils and recent alluvial soils support a large percentage of the present agriculture."

Including rough stony land, 35 soil types of 13 series are mapped, of which the Lahontan silty clay loam, Olympic stony loam, and rough stony land cover 14.8, 13, and 12.7 per cent of the area, respectively.

Soil survey of the Pasadena area, Cal., E. C. ECKMANN and C. J. ZINN (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1915, pp. 56, pls. 3, fig. 1, map 1*).—This survey, made in cooperation with the California Experiment Station, deals with the soils of an area of 270,720 acres in southern California, lying partly in San Bernardino County, but mainly in Los Angeles County, The topography of the area varies from mountainous to low and rolling, with elevations ranging from 225 ft. to 2,000 ft. above sea level. The region as a whole is well drained.

The soils of the area are derived from igneous and sedimentary formations and from unconsolidated deposits. Twenty-three soil types of nine series are mapped in addition to areas designated as rough broken land, rough stony land, and river-wash. Rough broken land occupies 16.3 per cent of the area, Hanford fine sandy loam 12.3 per cent, and Hanford gravelly sandy loam 10.4 per cent.

Soil survey of Crisp County, Ga., E. T. MAXON and D. D. LONG (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 24, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture, deals with the soils of an area of 173,440 acres in southwestern Georgia, including three physiographic divisions, namely, the Altamaha Uplands, the Dougherty Plain, and the "flatwoods." The topography varies from gently undulating to rolling, and drainage is well established with the exception of a few low, flat, poorly drained areas and lime sinks.

The soils of the county are of Coastal Plain origin and are predominantly sandy with sandy clay subsoils. Fourteen soil types of 11 series are mapped in addition to swamp. Norfolk sandy loam, Tifton sandy loam, and Plummer sandy loam occupy 31.7, 23.1, and 14.8 per cent of the area of the county, respectively.

Soil survey of Benton County, Ind., G. B. JONES and J. B. BRILL (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 20, fig. 1, map 1*).—This survey, made in cooperation with the Indiana Department of Geology, deals with the soils of an area of 261,120 acres in northwestern Indiana. The topography of the county varies from level to gently rolling with the highest elevations in the north-central part. The natural drainage is described as immature, with overflow or bottom lands of small extent.

The soils of the county are derived from glacial drift and water-laid deposits of glacial and more recent origin and are characteristic of the prairie regions that extend westward through Illinois. In addition to muck, five soil types each representative of one series are mapped, Brookston silt loam and Carrington silt loam occupying 64.6 and 26.8 per cent of the total area of the county, respectively.

Soil survey of Scott County, Iowa, E. H. STEVENS, E. H. SMIES, and K. ESPE (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1915, pp. 43, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station deals with the soils of an area of 291,200 acres in eastern Iowa, the topography of which is prevailingly rolling, the central and western parts of the county being comparatively level. Surface drainage is said to be good throughout the county. The area lies wholly within the glacial and loessial province.

Including muck, 23 soil types of 13 series are mapped, of which the Muscatine silt loam, the Memphis silt loam, and the Wabash silt loam cover 52.1, 15.1, and 14.4 per cent of the area, respectively.

Soil survey of Dawes County, Nebr., R. R. Burn, L. V. Davis, J. M. Snyder, F. A. Hayes, and T. E. Kokjer (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1915, pp. 41, fig. 1, map 1*).—This survey, made in cooperation with the University of Nebraska, deals with the soils of an area of 897,280 acres in northwestern Nebraska, the topography of which varies from flat in the alluvial tablelands to very steeply rolling in the Pine Ridge areas. Drainage is said to be generally well established.

The soils of the county are of residual and alluvial or colluvial origin. Including rough broken land and bad lands, 22 soil types of 8 series are mapped, of which Pierre clay and Rosebud very fine sandy loam cover 20.1 and 19.5 per cent of the area, respectively.

Soil survey of Cortland County, N. Y., E. T. Maxon and G. L. Fuller (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 28, fig. 1, map 1*).—This survey, made in cooperation with the New York State College of Agriculture, deals with the soils of an area of 321,920 acres in central New York situated in the Allegheny Plateau with an elevation ranging from approximately 1,000 to 2,000 ft. above sea level. The topography varies from nearly level in the valleys to rolling and hilly in the uplands, with good drainage.

The soils of the county have been derived from glacial débris composed largely of local sandstone and shale material. Seventeen soil types of nine series are mapped in addition to meadow and muck. Lordstown silt loam, Lordstown stony silt loam, and Volusia silt loam occupy 31.7, 28.4, and 13.4 per cent of the area, respectively.

Soil survey of Columbus County, N. C., R. B. Hardison, R. T. A. Burke, L. L. Brinkley, and R. C. Jurney (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1915, pp. 42, fig. 1, map 1*).—This survey, made in cooperation with the North Carolina Department of Agriculture, deals with the soils of an area of 582,400 acres in the southern corner of North Carolina, lying in the flat seaward part of the Coastal Plain province. The topography of the county varies from large, flat, poorly drained areas in the southeast to gently rolling and better drained sections to the north.

The soils of the county are composed of marine sediments, together with extensive areas of cumulose deposits. Twenty-three soil types of 14 series have been mapped besides fairly large areas of peaty muck, muck, and swamp. Norfolk fine sandy loam and Coxville fine sandy loam occupy 32.2 and 11.9 per cent of the total area of the county, respectively.

Soil survey of Hertford County, N. C., E. S. Vanatta and F. N. McDowell (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 35, fig. 1, map 1*).—This survey, made in cooperation with the North Carolina Department of Agriculture, deals with the soils of an area of 220,800 acres in northeastern North Carolina. The county lies wholly within the Coastal Plain region, with a topography varying from level or gently undulating to gently rolling. The drainage is poor in the level to gently undulating areas and good in the more rolling areas.

The soils of the county are derived from unconsolidated sands and clays of sedimentary origin. Eight soil types of five series are mapped in addition to swamp. Norfolk fine sandy loam, Coxville very fine sandy loam, Coxville fine sandy loam, and swamp occupy 34.1, 25.5, 17.5, and 15.2 per cent of the total area of the county, respectively.

Soil survey of Portage County, Wis., W. J. Geib, L. R. Schoenmann, and L. P. Hanson (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1915, pp. 52, fig. 1, map 1*).—This survey, made in cooperation with the State of Wisconsin, deals with the soils of an area of 519,680 acres in central Wisconsin, being a

more detailed study and reclassification than that previously noted (E. S. R., 16, p. 27; 19, p. 417).

The soils of the county are of glacial, residual, alluvial, or possibly loessial origin, together with an accumulation of organic matter in the low places resulting in the formation of peat, which occupies 16.4 per cent of the total area. Exclusive of the peat, 23 soil types of nine series have been mapped, of which Plainfield sand, Gloucester sand, and Gloucester sandy loam cover 15.1, 14.2, and 10.9 per cent of the area, respectively.

Soil survey of Wood County, Wis., W. J. GEIB, G. CONREY, W. C. BOARDMAN, and C. B. POST (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1915, pp. 51, fig. 1, map 1*).—This survey, made in cooperation with the State of Wisconsin, deals with the soils of an area of 517,760 acres in central Wisconsin, the topography of which is level to rolling. The soils of the area are of glacial, residual, alluvial, and possibly loessial origin.

Including muck, peat, and sands, 19 soil types of seven series are mapped, of which the Spencer silt loam, Vesper silt loam, and peat cover 25.9, 15, and 13.1 per cent of the area, respectively.

Soil experiments on the Ozark upland, M. F. MILLER and F. L. DULEY (*Missouri Sta. Bul. 148 (1917), pp. 28, figs 7*).—This reports the results of experiments in soil management begun in 1910, near St. James, Mo., on Gerald silt loam in the nontimbered parts of the Ozark region and forms one of a series of such studies on various soil types throughout the State. The plan of the experiment embraces a four-year rotation of corn, soy beans, wheat, and clover grown alone and under different soil treatments, including the use of legumes, barnyard manure, lime, rock phosphate, bone meal, and potash. The average yields per acre of all crops for the period of the experiment were as follows:

Average yields per acre of all crops grown on St. James experiment field, 1911-1916.

Treatment.	Corn.	Corn stover.	Wheat.	Wheat straw.	Soy beans.	Cowpeas, 4 crops.	Clover, 2 crops.
	Bu.	*Lbs.*	*Bu.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Legume	20.75	1,334	10.95	1,133	2,927	1,488	775
Legume, lime	24.98	1,607	12.08	1,281	3,196	1,666	1,687
Legume, lime, bone meal	26.56	1,674	18.56	1,963	3,273	2,017	4,912
No treatment	20.84	1,481	8.75	894	2,592	1,387	657
Legume, lime, bone meal, potash	36.25	2,286	21.85	2,344	3,392	2,065	5,425
Manure	43.01	2,593	17.71	2,062	3,646	2,727	3,087
Manure, rock phosphate	44.88	2,735	21.38	2,535	3,934	2,988	3,837

Tabulated data are presented and discussed, showing the results obtained with each crop separately, and the cost of production and the monetary returns from the different soil treatments.

Barnyard manure showed the highest net return for any one fertilizing material, amounting to $7.07 per acre annually, or $3.54 per ton for an 8-ton application once in four years. Eight tons of barnyard manure and 1,000 lbs. of rock phosphate, applied to clover stubble and plowed under, showed the highest annual net return for any combination of treatments, $8.89 per acre. Bone meal netted $2.43 annually, rock phosphate $1.81, and potash $1.88 per acre. Lime applied at the rate of 2 tons per acre at the beginning of a 6-year period was profitable, but the legume treatments alone have not been profitable.

Recommendations for soil management, based on the results obtained in these experiments, are outlined in detail. The main features are a system of live-stock farming in which little grain is sold and all the manure carefully

returned to the land, the manure to be supplemented with ground limestone, raw rock phosphate, bone meal, acid phosphate, or a highly phosphatic mixed fertilizer, and a small amount of potash (when prices are normal) applied in the course of a systematic crop rotation.

[Fertilizer experiments], W. P. Brooks and E. F. Gaskill (*Massachusetts Sta. Rpt. 1916, pp. 45a–56a*).—Progress reports are made on experiments previously noted (E. S. R., 36, p. 121), including comparative tests of manure alone and nitrate of soda, sulphate of ammonia, and dried blood in various fertilizer combinations on Japanese millet; muriate *v.* sulphate of potash on corn, soy beans, alfalfa, blackberries, and raspberries; manure and various combinations of chemical fertilizers on beets and onions, limed and unlimed; different kinds of phosphates on corn; kainit, high-grade and low-grade sulphate, muriate, nitrate, and carbonate of potash, and feldspar on mixed grass and clover; fertilizer high in potash and low in phosphoric acid *v.* one low in potash and high in phosphoric acid on corn; various combinations of fertilizers, with and without lime, on corn; different systems of top-dressing grass; sulphate of ammonia *v.* nitrate of soda as a top-dressing for hay lands; and different methods of applying manure and different kinds of lime compounds on soy beans and corn.

The yield of onions on plats continuously fertilized with sulphate of ammonia was increased 60 per cent and more by liming. Similar results, but less pronounced, were obtained in case of beets. On plats continuously cropped with onions there was with one exception no benefit from the addition of chemicals to manure. The best source of nitrogen for onions was nitrate of soda and the least beneficial was sulphate of ammonia; there was little difference in effect between muriate and sulphate of potash. Considering the fact that no potash was applied in 1916 " it would seem that on land in a high state of cultivation, which has received liberal annual applications of fertilizers containing potash, a good crop [of onions] might be expected for at least one year without the use of any potash."

In 19 years' experiments with different sources of potash, high-grade sulphate has proved the best source of potash for legumes. No benefit has been derived from the use of feldspar in either large or small quantities. Kainit and muriate have given fully as good results as the other potash salts with timothy and redtop. Potatoes receiving no potash have proved less resistant to blight than those fertilized with potash.

The largest yields of corn in experiments continued since 1890 have been obtained where potash was added to the fertilizer used. The results of experiments on grass during the past year, in which potash was omitted from the fertilizer, " seem to indicate that on permanent mowings, where it has been the custom for several years to apply annually a liberal application of chemicals or manure, potash may be omitted for at least one year and still a normal crop be obtained."

The yields of hay on permanent grasslands which had been continuously top-dressed for 9 years with nitrate of soda and sulphate of ammonia were largest in 1916 in case of the nitrate of soda.

The results of five years' comparative tests of applying manure as it is hauled from the stable in winter and of piling it in large heaps and spreading in the spring were invariably in favor of the latter method of application, although the advantage was small.

In tests of different forms of lime compounds on corn and soy beans the results appeared to favor hydrated lime and limoid as compared with marl and ground limestone. The results obtained in these tests also indicated " that land which has received annually a liberal application of manure for several

years will produce satisfactory crops for some time without further fertilization."

The lime and fertilizer needs of Indiana soils, S. D. CONNER (*Indiana Sta. Circ. 66 (1917), pp. 19, figs. 8*).—This circular, based on the results of various studies of Indiana soils, identifies and classifies in a general way the principal types of soil of the State, and gives methods whereby the soils may be tested for their lime and fertilizer requirements by farmers, teachers, or agricultural agents.

It is shown that many of the soils have declined in productiveness as a result of exhaustive cropping. The soils have been depleted especially in organic matter and nitrogen but also in available phosphoric acid. Over three-fourths of them are acid, and on practically all of these available phosphoric acid is needed, either with or without lime. "Potash fertilization has proved profitable on some soils. Neutral or slightly acid muck and black sand soils need potash, particularly for corn."

A soil-acidity map and other data are given, showing the relative proportion of very acid, medium acid, slightly acid, and neutral soils in each county of the State, as determined in over 4,000 samples of soil by the potassium nitrate method. These data show that no section is without an abundance of acid soils, the relative proportion for the entire State being 19.6 per cent very acid, 24.2 per cent medium acid, 38.2 per cent slightly acid, and 18 per cent neutral.

Practical methods of overcoming the soil deficiencies, such as the growing of more leguminous crops, liming, use of acid phosphate and potash, and more careful conservation and use of manure and crop residues, are discussed.

Redeeming an impoverished soil, C. E. THORNE (*Mo. Bul. Ohio Sta., 2 (1917), No. 10, pp. 339–343*).—Increased yields of corn, soy beans, wheat, and hay, grown in rotation on the rather depleted flat, silty clay land of Clermont County (Ohio), were secured from applications of different combinations of commercial fertilizers, lime, and manure. The estimated value of the increase is noted in each case for the period of 1912 to 1917. It is concluded that under present market conditions of fertilizers and crops, an increased net income of $3 per acre or more, annually, could be attained by the use of chemical fertilizers alone, but that under a system whereby manure could be applied at the actual cost of moving it from the stable to the field, necessitating the purchase of only acid phosphate, an increased net income of $5 per acre or more would be possible.

Fertilizer requirement of DeKalb soil (*Pennsylvania Sta. Bul. 147 (1917), pp. 20–22, fig. 1*).—Preliminary pot and small plat tests, begun in 1915, with various legumes and grasses on both abandoned farm land and virgin cut-over land to determine the fertilizer requirements of DeKalb soil are reported. In the small plat test limestone, applied at the rate of 5,000 lbs. per acre, was compared with an unlimed area. In the pot tests various fertilizers were tested in different combinations.

Limestone alone produced the following results, in pounds per acre, on the two soils on small plats. Green sweet clover, limed, 4,083 and 7,984, respectively, unlimed, nothing; green red clover, limed, 3,886 and 3,896, unlimed, 1,523 and 2,213. "Orchard grass gave better results than either brome or blue grass on the plats treated with limestone. In the pot tests the greatest growth of blue grass on the farm soil occurred in the pots treated with lime, nitrate of soda, and acid phosphate, while the lime, nitrate of soda, acid phosphate, and potash treatment produced the greatest yield on the virgin soil. Limestone and phosphoric acid gave an increase of 125 per cent of sweet clover over limestone alone on the farm soil as compared to 580 per cent on the virgin soil."

The relative value of single fertilizer ingredients, for the farm and virgin soils, respectively, based on the growth of sweet clover, was, nitrogen 25.1 and 200, phosphoric acid 73.1 and 275, and potash 57.1 and 135.

"Based on the growth of sweet clover, phosphoric acid and limestone is conclusively the most economic treatment for building up these DeKalb soils. Phosphoric acid gave an increased growth in each case and its absence depressed the yield without exception. Nitrogen proved to be unnecessary for the production of red clover on DeKalb soil."

Thirty-five years' results with fertilizers (*Pennsylvania Sta. Bul. 147 (1917), pp. 17–20, fig. 1*).—The principal conclusions and recommendations from these experiments are summarized, the work having been noted in detail elsewhere (E. S. R., 37, p. 626).

Progress of green manuring in Mysore, A. K. YEGNANARAYANA IYER (*Mysore Agr. Calendar, 1917, pp. 14, 15*).—The green manuring of paddy lands and of sugar-cane plantations with leaves of the honge tree (*Pongamia glabra*) and with green-manure crops grown on the fields is briefly discussed. Crops used in the latter instance included sunn hemp, cowpeas, green gram, black gram, horsegram, *Crotalaria striata*, and daincha.

Previous studies in green manuring in Mysore have been noted (E. S. R., 27, p. 21).

[The relative value of oil cakes available in Mysore and the results of oil-cake manuring on sugar cane], H. V. KRISHNAYYA, A. K. YEGNANARAYANA IYER, and D. G. RAMACHANDRA RAO (*Mysore Agr. Calendar, 1917, pp. 18–23*).—The nitrogen content of the oil cake of safflower, peanut, white castor, black castor, neem (*Melia azadirachta*), honge (*Pongamia glabra*), and cotton seed is reported as determined by the Mysore Department of Agriculture. The analyses ranged from 3 to 8 per cent, with safflower cake showing the highest percentage. Greatly increased yields from the application of even small amounts of oil cake to sugar cane are briefly noted.

Cyanamid as a source of nitrogen (*Pennsylvania Sta. Bul. 147 (1917), pp. 23–25*).—Commercial cyanamid was compared with nitrate of soda and dried blood from 1912–1914, inclusive, for potatoes, oats, and wheat, and from 1913–1916 with nitrate of soda as a top-dressing for timothy.

The only significant differences were secured with potatoes, where increases over no nitrogen were obtained amounting to 32.8 bu. for nitrate of soda, 101.3 bu. for dried blood, and 56.7 bu. for cyanamid. With nitrogen as nitrate of soda used as a top-dressing for timothy, an average yield was obtained of 4,910 lbs. of field-cured hay per acre, and with cyanamid 4,618 lbs.

Availability of potash fertilizer residue in the soil (*Pennsylvania Sta. Bul. 147 (1917), pp. 38–40, fig. 1*).—A study of the availability of potash fertilizer residues in the soil is briefly noted, indicating that potash-treated land carries about twice as much potash removable by weak solvents as untreated land. Analyses of five crops, each grown in a different year upon treated and untreated land, show that the crops grown on treated soil removed 105.08 lbs. of potash in their grain and stalky parts, while those from the untreated plats removed 73.81 lbs. of potash to the acre yield. These results led to the following conclusions: "Clays and loams that have been well fertilized with potash until quite recently still hold in their surface layers considerable fertilizer potash in condition to feed the crops for several years. Hence for most field crops inability to supply fertilizer potash at this time does not threaten a great reduction in yields from lands of such history."

Relative value of limestone of different degrees of fineness (*Pennsylvania Sta. Bul. 147 (1917), pp. 22, 23, fig. 1*).—Experimental data are presented on the relative value of limestone of different degrees of fineness, based upon its

solubility in water, its value in correcting acidity, its value in the formation of nitrates, its influence upon the growth of plants, and the rate of loss from the soil.

"On the basis of the results obtained it was concluded, (1) that an application of limestone in which the entire product consists of very fine material is less desirable from the standpoint of permanent agriculture than one consisting of varied degrees of fineness; (2) that an ideal application of limestone is one in which there is sufficient fine material (60-mesh) to meet the immediate needs of the soil and thus allow time for the coarser particles to disintegrate; [and] (3) that if the entire product will pass a 10-mesh screen and include all of the fine material, it is sufficiently fine for soil improvement if applied somewhat in excess of the immediate needs of the soil. Such a product should contain at least 50 per cent of material that will pass a 60-mesh screen."

Effect of sulphur on different crops and soils, O. M. Shedd (*U. S. Dept. Agr., Jour. Agr. Research, 11* (*1917*), *No. 4, pp. 91–103*).—Investigations are reported from the Kentucky Experiment Station on the effect of applications of 100 and 200 lbs. of flowers of sulphur on soy beans, clover, oats, alfalfa, and wheat, grown on eight rather depleted surface soils, each representative of a distinct soil type in Kentucky. The experiments were conducted in triplicate in the greenhouse. Tabulated data show the weight of the total air-dried materials for each crop on each soil type; the total and sulphate sulphur in air-dried soy beans, clover, and alfalfa; the percentage of sulphur as sulphate in 16 varieties of garden and field seeds before and after germination; and the protein content of air-dried soy beans, tops and seed.

In summarizing the author states that "the results show that the sulphur increased the production of some crops, had no effect on others, and on some was injurious, depending on the crop and the soil on which it was grown. There was a preponderance of gains, however, from the sulphur application, but these were generally small.

"Analyses of some of the crops show that the sulphur increased the total and sulphate-sulphur content of the plant, and the greater the application the greater the increase. Where sulphur was applied to clover and alfalfa the excess sulphur in those plants was in the form of sulphate, while in soy beans part of the excess was in another form.

"In soy beans which showed an increased sulphur content, no corresponding increased protein content was always found. In five instances out of eight, however, soy beans grown in soil where sulphur was added show an increase in the total weight of protein.

"It was found that of the 16 varieties of field and garden seeds examined some contain sulphates, while others do not, but that on germinating all except 2 form a greater or less amount of sulphate. The highest sulphate content obtained in the ungerminated seed was 0.048 per cent in clover, and the increase due to germination varied from none in corn to 0.035 per cent in the onion. There was a slight loss in only one sample—clover."

AGRICULTURAL BOTANY.

The effect of one plant on another, S. Pickering (*Ann. Bot.* [*London*], *31* (*1917*), *No. 122, pp. 181–187, figs. 3*).—Washings from growing plants have been shown to be deleterious to other plants reached by such washings. Susceptible plants thus far found include apple, pear, plum, cherry, forest trees (six kinds), mustard, tobacco, tomato, barley, clover, and two varieties of grasses. Plants exerting this injurious influence include apple (seedlings), mustard, tobacco,

tomato, 2 varieties of clover, and 16 varieties of grass. In no case have negative results been obtained, though the degree of injury varied greatly, this variation being ascribed mainly to the condition (vigor) of the plants employed. The reduction of growth due to this treatment varied from 6 to 97 per cent.

Tests employing the method of exclusion narrowed down the possible causation of injury to trees by grass to the possible formation of some deleterious substance by the growing grass, the effect being strongly suggestive of a toxin. Exposure of the leachings to the air for 24 hours removed the toxic property. A 2-in. layer of pumice stone acted in the same beneficial manner. The effect of a plant on its own kind is apparently greater than on a plant of another kind. A stronger plant not only keeps ahead of a weaker or younger one, but an older plant usually gains on a younger one continually.

Fungus fairy rings in eastern Colorado and their effect on vegetation, H. L. Shantz and R. L. Piemeisel (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 5, pp. 191–246, pls. 21, figs. 15*).—This paper deals with fairy rings caused by fleshy fungi, the studies on which were made on the high plains at Akron, Colo., during the period from 1907 to 1916, inclusive. The fairy rings are distinguished as those in which the vegetation is killed or badly damaged, caused by *Agaricus tabularis;* those in which the vegetation is only stimulated, caused usually by species of Calvatia, Catastoma, Lycoperdon, Marasmius, etc.; and those in which no effect can be noted on the native vegetation, caused by *Lepiota* spp.

The authors report that fairy rings start from the point of germination of the fungus spores and spread outward at approximately an equal rate in all directions. Growth is continuous until some obstacle is met with, which may be passed around in case of ant hills, but growth is terminated where two rings come in contact. As the fungus filaments spread outward they are said to consume a portion of the organic matter of the soil. The carbohydrates are consumed, and the proteid portion is changed into amino acids and then into ammonia.

The effect of the fungus filaments on the soil is to reduce a part of the organic matter to ammonia, which is combined to form ammoniacal salts or is converted by bacteria into nitrites and later into nitrates. When the mycelium dies, it is reduced by bacterial action to ammonia, which may later be built up into nitrates. The increase in available nitrogenous material in the soil occupied by the young mycelium is said to stimulate the growth of the grasses or other young plants, which consequently make greater demands on the soil moisture. When this is exhausted, as in the case of *A. tabularis*, the mass of fungus filaments prevents the penetration of rain water. The intense drought to which the plants are thus subjected kills off the buffalo and grama grasses and the other plants which may be associated with them, and the area is left bare for the invasion of other plants. The mycelium after a few years dies, leaving the soil still more enriched and no longer impervious to water.

The stages in the succession on the bare areas are an early weed stage, followed by a late weed stage, and this in turn by a short-lived grass stage, which is succeeded by a perennial stage, and this finally gives way to the original short grass cover.

Growing alien cacti in Michigan, W. E. Praeger (*Rpt. Mich. Acad. Sci., 17 (1915), pp. 156–158*).—Thirteen species of cacti, representing four genera, from various altitudes in Arizona were tested in Michigan with the result that all died out in four winters. The general conclusion is that Arizona cacti can not survive Michigan winters, the warm, wet autumn weather probably being important in this connection. Cacti native to this region show a gradual loss of turgidity in the fall, which is thought to serve as the equivalent of a

deciduous habit and to be closely related to the ability of certain species of cacti to endure the Michigan winters.

Does the movement of air affect the growth of plants? ALMA HOLLINGER (*Rpt. Mich. Acad. Sci., 17 (1915), pp. 159, 160*).—In a preliminary report on investigations not yet completed, the author states that in darkness the movement of air apparently does affect favorably the rate, duration, and vigor of growth; also that it affects coloration, leaf spread, etc., in the several plants tested.

A method of controlling the rate of air movement in transpiration experiments, V. H. BLACKMAN and R. C. KNIGHT (*Ann. Bot. [London], 31 (1917), No. 122, pp. 217–220, fig. 1*).—The authors, considering it advisable that transpiration and evaporation experiments with plants be carried on under conditions of constant air movements regulable at will, have devised an air-flue apparatus which is described as convenient, reliable, and satisfactory for air movement up to about 25 meters per minute.

The interrelations of stomatal aperture, leaf water content, and transpiration rate, R. C. KNIGHT (*Ann. Bot. [London], 31 (1917), No. 122, pp. 221–240, figs. 4*).—Employing the air-flue apparatus above described in tests with various plants (of which *Eupatorium adenophorum* was found to be the most useful for this purpose) under controlled conditions, the author claims to have found that in many cases there is no necessary agreement (often, in fact, an inverse relation) between stomatal opening and transpiration rate. Water content of the leaf shows a close and direct relation to transpiration rate. Stomatal aperture is not reduced by slight water deficiency in the leaf, so that stomatal response to incipient drying may be excluded as a chief factor in the maintenance of water content. Stomata are, however, very sensitive to the changes in illumination, and with increasing light intensity continued opening of the stomata may coincide with continued decrease of water content.

On the reduction of transpiration observations, N. THOMAS and A. FERGUSON (*Ann. Bot. [London], 31 (1917), No. 122, pp. 241–255, fig. 1*).—Experiments described are claimed to show that the evaporation from a circular water surface is not proportional to the area of the surface if that surface be within 2 or 3 cm. of the top, nor is it proportional to the linear dimensions of a surface. It is stated to be, for full circular containers, approximately proportional to the cube of the square root of the radius. Errors amounting to as much as 40 per cent are claimed to arise in determining the water surface equivalent to a given atmometer.

Methods of calibration are described which are claimed to obviate such errors.

Oxidation and reduction in vegetable tissues.—I, The mechanism of the reaction, J. WOLFF (*Ann. Inst. Pasteur, 31 (1917), No. 2, pp. 92–95*).—Three phases of the more mechanical part of this work are presented and briefly discussed in this article as preparatory to the report given below.

Oxidation and reduction in vegetable tissues.—II, The presence in a large number of plants of a diphenol presenting important analogies with pyrocatechin, J. WOLFF and NADIA ROUCHELMAN (*Ann. Inst. Pasteur, 31 (1917), No. 2, pp. 96–105*).—Discussing briefly the method employed and tabulating the results of observations made on a large number of plants, the authors conclude that peroxid is not present in vegetable sap, the presence of an oxidase (laccase) being necessary to the production of a positive result. It is thought that the reaction which has been believed to show the presence of nitrites and of peroxids in plants, and the eventually injurious effects of the latter, are due in the large majority of instances to the presence of a phenol, probably pyrocatechin. This is considered to play an important part in the processes of oxidation and reduction that occur in plants.

On the mechanism of translocation in plant tissues.—An hypothesis with special reference to sugar conduction in sieve tubes, S. MANGHAM (*Ann. Bot.* [*London*], *31* (*1917*), *No. 122, pp. 293–311, figs. 2*).—This is a discussion of the data and views of various contributors regarding the processes which occur in a plant cell during certain phases of sugar translocation with a view to developing an outline of a working hypothesis.

It is stated that definite relations obtain between the solute concentration at the surface of absorbing particles introduced into the solution and the concentration of the solute in the solvent, this state of equilibrium being reversible in cases cited.

The influence of light and chlorophyll formation on the minimum toxic concentration of magnesium nitrate for the squash, R. B. HARVEY and R. H. TRUE (*Amer. Jour. Bot.*, *4* (*1917*), *No. 7, pp. 407–410, figs. 2*).—The minimal toxic concentration of magnesium nitrate for squash grown in water cultures was raised from 125 N $\times$ 10^{-6} in darkness to 200 N $\times$ 10^{-6} in light. This change was presumably correlated with the removal of magnesium from toxic compounds to form chlorophyll.

The toxicity of galactose and mannose for green plants and the antagonistic action of other sugars toward these, L. KNUDSON (*Amer. Jour. Bot.*, *4* (*1917*), *No. 7, pp. 430–437, figs. 4*).—Having extended the studies previously reported (E. S. R., 35, p. 28; 36, p. 125) to include numerous experiments with various sugars other than galactose, employing methods which are described, the author shows that mannose also is toxic to the roots of some plants, and that this toxicity is lessened by either glucose or saccharose. Mutual antagonism was not found to exist between galactose and mannose.

Dr. Beal's seed vitality experiments, H. T. DARLINGTON (*Rpt. Mich. Acad. Sci.*, *17* (*1915*), *pp. 164–166*).—Giving some account of the progress of the series of experiments conducted by Beal since 1879 (E. S. R., 17, p. 463; 24, p. 195; 34, p. 732), the author reports the results of his endeavors to obtain germination from seed samples taken out the thirty-fifth year.

Of the 22 species originally employed, 8 are said to have failed to germinate up to and after the fifth year, the remaining species germinating some years, and *Lepidium virginicum* (probably also *Rumex crispus*) germinating every year. The best results were formerly obtained by moistening the sand so as to get a few seeds to come up, then allowing the sand to dry out partly, moistening again, and so on, repeating this at varying intervals for several months. This plan has been adopted by the author and the tests are reported as still in progress.

The nongermination of seeds of fleshy fruits, J. MASSART (*Bul. Sci. France et Belg.*, *50* (*1916*), *No. 3, pp. 167–169; abs. in Rev. Sci.* [*Paris*], *55* (*1917*), *No. 10, p. 309*).—Tests of seeds of a number of dry or fleshy fruits in vegetable juices, saccharose of different concentrations, and water are said to indicate that the delaying influence of these juices on the germination of fleshy fruits and their destructive action on dry fruits show a variation parallel to that of their osmotic pressure, from which it appears that concentration is the condition essential to such influences. Seeds of different plants are unequally sensitive to these juices. The juice of the blackberry and that of watermelon appear to be particularly injurious.

Some factors concerned in the germination of rust spores, E. B. MAINS (*Rpt. Mich. Acad. Sci.*, *17* (*1915*), *pp. 136–140*).—This work, initiated because of the difficulty of obtaining germination during the summer months and done mainly during the summer of 1914, was carried out principally with uredospores, though a few teleutospores and æcidiospores were tested. Details are given of the tests and the results thereof in case of *Puccinia coronata* (*P. coronifera* or

P. rhamni), *P. taraxaci*, *P. sorghi*, *P. phlei-pratensis*, *P. polygoni*, *Uromyces trifolii*, *Coleosporium solidaginis*, *Melampsora bigelowii*, *M. medusæ*, *Cronartium comptoniæ* (æcidial stage, *Peridermium comptoniæ*), and *C. comandræ*.

The general factors controlling spore germination appear to be temperature and moisture. Other factors are discussed in connection with the work of other investigators.

Light and pycnidia formation in the Sphæropsidales, E. LEVIN (*Rpt. Mich. Acad. Sci., 17 (1915), pp. 134, 135*).—In experiments for testing the effect of light in connection with the germination of seven members of the Sphæropsidales, only three germinated at all in the darkness, the percentage being about 30 to 40, while in the light representatives of all of the genera germinated, giving percentages ranging from 30 to 100. The cultures obtained in the darkness resembled in all respects those obtained in the light.

Some cultural characteristics of Pestalozzia funera, P. V. SIGGERS (*Rpt. Mich. Acad. Sci., 17 (1915), p. 141, pl. 1*).—Brief accounts are given of the results as regards the vegetative growth obtained in 14 days with *P. funera* grown on gelatin and upon several kinds of agar.

The colorimetric determination of hydrogen ion concentration and its applications in bacteriology, W. M. CLARK and H. A. LUBS (*Jour. Bact., 2 (1917), Nos. 1, pp. 1–34, figs. 4; 2, pp. 109–136, pl. 1, figs. 2; 3, pp. 191–236, fig. 1*).—The authors have made a study of the colorimetric method of determining hydrogen ion concentration, testing a number of indicators in a wide variety of solutions, such as are used for the cultivation of bacteria, and have carried out other related studies as described. They conclude that, with the improvements presented, the colorimetric method is available for routine as well as for research work in bacteriology.

A new apparatus for aseptic ultrafiltration, R. E. SMITH (*Phytopathology, 7 (1917), No. 4, pp. 290–293, figs. 2*).—A description is given of an apparatus designed for the production of aseptically filtered juice from unheated plant extract that may be used as a culture medium.

Irritability of the pollen-presentation mechanism in the Compositæ, J. SMALL (*Ann. Bot. [London], 31 (1917), No. 122, pp. 261–268*).—A record is made of the types and degrees of irritability observed in the pollen-presentation mechanism of 149 species and varieties of Compositæ. Of these, 64 per cent exhibit this phenomenon, and it was observed in all tribes of this family except the Eupatorieæ and the Vernonieæ. Notes are given also on certain special cases observed, as, for example, the explosive irritability in the Mutisieæ and a peculiar slow movement in the Cichorieæ.

Endothia pigments, I, L. A. HAWKINS and N. E. STEVENS (*Amer. Jour. Bot., 4 (1917), No. 6, pp. 336–353, figs. 6*).—From the experimental work here described it appears that there are at least three different pigments formed by species of Endothia, pigment A, apparently common to all the species; pigment B, present in *E. fluens* and probably in all species showing a similar spectral transmission of the acid alcohol solutions; and pigment C, present in the two groups typified by *E. fluens* and *E. parasitica*. These pigments may be closely related chemically, perhaps derivatives of the same substance, as they are similar in many particulars. The data and opinions of other investigators are considered in connection with detailed observations by the authors.

Observations on an Achlya lacking sexual reproduction, W. H. WESTON (*Amer. Jour. Bot., 4 (1917), No. 6, pp. 354–367, pl. 1*).—The fungus here described, though presenting characters distinctive of the genus Achlya as regards zoospore production, liberation, character, and behavior, is distinguished from most species of this genus by its lack of sexual reproduction and by its nonproduction of oogonia and antheridia under the culture methods usually suc-

cessful in developing these organs. This fungus, however, consistently produces, under widely varying conditions, resistant spores of nonsexual origin and distinct morphological characters, differing from the gemmæ described for other species in their regular occurrence and clearly defined structure. It is regarded as an Achlya that has lost its power of sexual reproduction, the resistant character usually assumed by the reproductive bodies of sexual origin having in this case been taken over by the nonsexual resistant spores.

Fertility in Cichorium intybus: The sporadic occurrence of self-fertile plants among the progeny of self-sterile plants, A. B. Stout (*Amer. Jour. Bot., 4 (1917), No. 7, pp. 375–395, figs. 2*).—The author, reporting with discussion further data obtained from a subsequent study of stock derived from cultures previously used (E. S. R., 36, p. 523), states that the evidence appears conclusive that the actual conditions giving the various grades of self-compatibility, and of self-incompatibility as well, are decidedly individual. The sporadic development of self-compatibility, giving self-fertility among the progeny of self-sterile lines, is frequent in the cultures herein reported. Cytological studies are planned with regard to the questions of relative development and nuclear phenomena in chicory.

In case of physiological incompatibility, as in these cases, there is thought to be no impotence except of a purely accidental sort. Any recombination may survive. The evidence does not indicate selective or preferential matings, favoring fusion between particular recombinations of germ plasm with respect to hereditary characters. The sporadic variability of the sex relations and their fluctuating inheritance is emphasized. A number of possibilities are suggested.

Inheritance of endosperm color in maize, O. E. White (*Amer. Jour. Bot., 4 (1917), No. 7, pp. 396–406*).—The author gives particulars of studies of crosses of a variety of maize having yellow endosperm with one having white endosperm, giving white only in F_1 and approximately 3 white to 1 yellow in F_2, with further results. Some of these are interpreted as due mainly to the presence or absence of an endosperm color suppression factor. He claims that, including the one mentioned, there are at least three and possibly five pairs of factors concerned in the determination of endosperm color in maize.

Inheritance studies in Pisum.—IV, Interrelation of the genetic factors of Pisum, O. E. White (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 4, pp. 167–190*).—This paper describes and discusses the number of demonstrated factors in Pisum, their modifying effects upon each other's expression, the modification of their expression by different environments, and their relation to one another in inheritance, whether independent or linked.

Thirty-five genetic factors are listed and discussed. The presence and absence of these 35 factors are said to be responsible for 70 or more differential characters. The modifying effects of the expression of one factor upon another and the effects of external environmental conditions upon the expression of these factors are described. Data involving many thousand F_2 generation progeny indicate that certain factors are independently inherited, that is, they are not linked, unless the linkage is very loose. Data for four linked groups are presented, three of which involve some of the factors mentioned above and one the relations of which to the other seven are still undetermined.

FIELD CROPS.

Factors influencing the water requirements of plants, C. C. Thom and H. F. Holtz (*Washington Sta. Bul. 146 (1917), pp. 3–64, figs. 18*).—This reports extensive investigations of the various factors influencing the water require-

ments of plants embracing experiments with different field crops grown in galvanized-iron tanks from 1911 to 1913, inclusive, in field plats from 1912–1914, inclusive, and in sand cultures to which were added nutrient solutions of varying concentration. Considerable tabulated data are present showing the water requirements of crops under field conditions. The results are depicted by graphs. Additional data show the effect upon the water requirements of plants of the following factors: Kind of crop, percentage of ash in plants, concentration of the nutrient soil solution, fallowing, individual plant food elements, alkali salts, previous cropping, variety, stage of development, and percentage of capillary saturation. The conclusions reached have been summarized as follows:

"The numerous conditions surrounding plants that influence their growth and water requirement and the adaptability and habits of the plant to meet these conditions make it impossible to give any definite water requirement for any plant, or even to give the relative order in which a given number of varieties will stand in respect to this factor. The average water requirement [pounds of water required to produce a pound of dry matter] of 6 cereal crops was 312, and for 4 legumes, 429. The daily amount of water transpired by wheat, corn, oats, and peas increased until about the beginning of the ripening period; from this time there was a gradual decrease up to maturity. The depth to which field crops took moisture was: Wheat, 9 ft.; oats, 8.5 ft.; barley, 8 ft.; peas, 6 ft.; millet, 5.5 ft.; corn, 5 ft.; beans, 5 ft. The crops that took the soil moisture from the greatest depth also had the greatest water requirement. Tanks proved to be equal to field plats in determining the water requirements of plants. The ash content of different plants increased with the increased water requirement.

"Plants grown in culture solutions varying in concentration from 0.01 to 0.1 per cent increased in total dry matter produced and decreased in water requirement. The average of 3 trials, a 0.01 per cent concentration gave a growth of 3.152 gm. of dry matter and a water requirement of 729; in a 0.1 per cent concentration, 39.2226 gm. of dry matter and a water requirement of 381. The percentage of roots in the total dry weight decreased from 43.2 per cent in a 0.0125 per cent concentration to 17.3 per cent in 0.1 per cent concentration of a nutrient solution. In like manner the water requirement was reduced from 605 to 262, respectively. The above results indicate that weak soil solutions cause an increased root development in plants.

"The water requirement of wheat was 34 per cent less, and for beans 19 per cent less, when grown on summer-fallowed soil than when grown on cropped soil.

"When any of the essential plant food elements—nitrogen, potassium, phosphorus, and calcium—were reduced to 0.02 per cent and 0.01 per cent of that contained in a normal solution used in culture solution work in this bulletin, the reduction of calcium and potassium made good growths and nitrogen and phosphorus poor growths. The water requirement was increased in each case except when calcium was deficient. When nitrogen was reduced to 0.01 per cent of the normal solution, 43.2 per cent of the total dry matter produced was roots. When calcium was reduced to 0.01 per cent of the normal solution, only 10 per cent was roots. Consequently a soil with a low nitrate content causes a plant to develop an abnormally large root system. Increasing the concentration of a complete culture solution by addition of alkali salts, viz, sodium carbonate, sodium sulphate, and sodium chlorid, decreased the water requirement until the solution became so concentrated to inhibit growth.

"The water requirement of wheat was less when grown on soil that had grown legumes and intertilled crops the previous season than the soil that had grown cereals. The difference obtained in the water requirement due to

variety in spring wheat is small. There is a decrease in the water requirement of wheat and oats with increase in age.

"The percentage of capillary saturation of the soil in which plants are grown is not an important factor in the water requirement of plants, provided the percentage of moisture is maintained considerably above the wilting point. The results of these investigations indicate that any condition which disturbs the normal life processes, be it soil, atmospheric, or pathological, increases the water requirement to just such a degree as it depresses the normal functionings of the plant."

A bibliography of 27 titles is appended.

A new method for harvesting small grain and grass plats, A. G. McCall (*Jour. Amer. Soc. Agron., 9 (1917), No. 3, pp. 138–140, figs. 2*).—A device for harvesting small grains and grasses in varietal and soil fertility tests is described and illustrated. The apparatus was constructed and used at the Maryland Experiment Station, where small areas of wheat and timothy plats were harvested, giving results which checked satisfactorily with records obtained from harvesting and thrashing entire plats.

[Report of field crops work in Nebraska] (*Nebraska Sta. Rpt. 1916, pp. XV–XVII*).—Water requirement investigations were continued through 1916, employing 425 potometers, and the relation of soil, climatic, and crop characters to the use of water by crops studied. Some of the more important conclusions arrived at are as follows:

"Transpiration is essentially evaporation. Changes in climatic conditions affect somewhat similarly the rate of water loss from a corn plant and that from a shallow physical free water surface. Variation in the water requirement from day to day is very marked. Occasionally this daily variation amounts to 300 or 400 per cent in successive days. The maximum variation observed in 2 successive days has been 600 per cent. On days of extreme temperature in very dry years there may be an atmospheric demand of 10 lbs. of water from a single average corn plant during 24 hours. . . . In a comparatively short time the corn may receive injuries from which it never fully recovers. Bearing this in mind it is evident that a period of brief duration may affect yields more than the annual amount of rainfall.

"A marked variation exists in the water requirement of different years, due to natural climatic differences. There is a rather consistent relationship in the relative seasonal variations between (1) transpiration per unit of dry matter, (2) transpiration per unit of leaf area, and (3) evaporation from a free water surface. There is no such thing as a definite water requirement which is constant for any one kind of crop. A reduction in soil-moisture content below the optimum during three years reduced the water requirement per pound of ear corn 4.3 per cent and per pound of total dry matter 7.9 per cent. This reduction in water requirement was, however, accompanied by 37.3 per cent reduced stalk yield, 28.5 per cent reduced yield of ear corn, and 30.7 per cent lower yield of total dry matter. . . .

"An increase in the soil-moisture content above the optimum during three years increased the water requirement per pound of ear corn 13.5 per cent and per pound of total dry matter 8.2 per cent. This increase in water requirement was accompanied by 11.3 per cent reduced stalk yield, 21.1 per cent reduced yield of ear corn, and 16.7 per cent lower yield of total dry matter. . . .

"The water requirement per pound of dry matter is much larger in an infertile soil than in a fertile soil. Increasing the fertility of the soil reduces the water requirement for grain production and for total dry matter. An application of manure has a much greater effect upon an infertile than upon a

fertile soil. Thus, as an average for two years, equal applications of sheep manure to infertile, intermediate, and fertile soils reduced the water requirements for ear corn production 42.6, 25.4, and 10.5 per cent, respectively. For total dry matter these water requirements were reduced 28.9, 17.1, and 8.1 per cent, respectively. However, the total water requirement per plant was increased by an application of manure to infertile, intermediate, and fertile soil, respectively, 106.7, 42.6, and 28.7 per cent. . . .

"The water requirement for milo maize was the same as the average for 11 corn varieties, while it was considerably higher for Black Amber sorghum. It appears that the drought-resistant qualities of certain crops must lie elsewhere than in a markedly low water requirement per pound of dry matter."

In cereal investigations it was concluded that small seed when compared in equal numbers with large seed appeared at a disadvantage, but when planted in equal weights the yields were practically the same. When grown in competition plants from large seed appeared to have a slight advantage over those from small seed.

[Report of field crops work in Pennsylvania] (*Pennsylvania Sta. Bul. 147* (*1917*), *pp. 25–31*, *figs. 4*).—Continuing work previously noted (E. S. R., 38, p. 34), a comparison of plowing depths of 7.5 and 12 in., both in the fall and spring, for crops in rotation since the fall of 1909 has led to the conclusion that fall plowing gave slightly better yields of corn than spring plowing, while with all other crops the time of plowing made no significant difference in yield. Deep plowing gave no greater yields than shallow plowing.

In variety tests with wheat Dawson Golden Chaff has given the highest average yield, 33.4 bu. per acre, for the period of 1911 to 1916, with 11 others ranging from 30 to 30.7 bu. per acre.

The range in average yield of marketable tubers of 43 varieties of potatoes tested for the period of 1911 to 1916 was from 88 to 177 bu. per acre. The leading varieties were Silver King, Pan American, Whiton White Mammoth, Petoskey, Heath Late Beauty, Hamilton Early, Norcross, and Rural New Yorker No. 2, in the order named.

The leading oat varieties for 1911 to 1916 were Big Four, New Zealand, Fourth of July, Joanette. Kherson, New Danish White, and Czar of Russia.

In soy bean variety tests the leading varieties in order of yield for the four years of 1913–1916, inclusive, were as follows: In seed—Ebony, Chestnut, Mongol, Ito San, Ohio 10015, and Amherst; and in hay—Ohio 7496, Ohio 10015, Chestnut, Medium Green, Ohio 9035, and Amherst. The average yield of seed for the four-year period for the 20 varieties in the test amounted to 14.2 bu. and of hay, 4,462 lbs. In experiments to test the value of soy beans in place of oats in the rotation, it was concluded that the crops are of about equal value, except possibly in southern Pennsylvania, where soy beans yield better and where oats are less profitable. Soy beans planted with corn have resulted in slightly increased yields of dry matter and of protein.

The fertilizer treatments and yields from 1910 to 1916, inclusive, for a cropping system of corn, wheat, and clover on depleted land are outlined, but no definite conclusions drawn.

[Report of field crops work for 1915], J. B. HARRISON, C. K. BANCROFT, and R. WARD (*Rpt. Dept. Sci. and Agr. Brit. Guiana, 1915, pp. 5–12, 13–15; Jour. Bd. Agr. Brit. Guiana, 10* (*1917*), *No. 2, pp. 62–79*).—A number of variety and hybrid tests with sugar cane and rice are reported, together with fertilizer tests with sugar cane.

Sulphate of ammonia resulted in a yield of 4.7 tons of cane per acre more than nitrate of soda. Applications equivalent to 450 lbs. of ammonium sulphate

showed a mean yield of 38 tons of cane for nine varieties as compared with 29.5 tons without nitrogen.

Tests on 48 duplicate plats showed an increase of only 0.9 ton of cane per acre upon the addition of acid phosphate, both with and without an accompanying nitrogenous fertilizer. Another series of experiments showed an increase of 4 tons of cane per acre over the untreated plats from an application of 600 lbs. of basic slag. Tests to determine the effect of acid calcium phosphate upon the sugar content of the cane juice indicated that it was practically negligible, the expressed juice showing 1.794 lbs. of saccharose and 0.061 lb. of glucose with the phosphate; and 1.77 lbs. of saccharose and 0,058 lb. of glucose without it.

A number of observations are recorded of seedling canes from selfed and uncontrolled parentage. Of the selected canes from uncontrolled parentage 57.2 per cent proved upon analysis to be of high potential value, while 58.3 per cent of the selected hybrid canes possessed similar characteristics. However, only 60 canes of hybrid origin were deemed suitable for analysis, whereas 430 canes of uncontrolled parentage were selected.

[Report of field crops work], A. A. Meggitt (*Ann. Rpt. Jorhat Agr. Expt. Sta., 1916, pp. 7–42; Ann. Rpt. Agr. Expts. Assam, 1916, pp. 7–25, 40–42*).—Extensive variety and cultural tests with sugar cane are reported for 1915–16. Cultural tests indicated that a planting rate of about 8,000 sets per acre was the optimum for the region, and that decreasing the distance between rows within the limits of from 3 to 5 ft., with the sets 2 ft. apart in the row, increased the total acre yield.

Liming and fertilizer tests with pigeon peas, millet, gram, mustard, corn, and oats, and green manuring tests with cowpeas and pigeon peas are briefly noted. Tests with wood ashes as a supplement to cow manure and in place of lime have given excellent results in increased oat yields.

[Report of field crops work at Anakapalle Agricultural Station], G. R. Hilson and D. Balakrishnamurti (*Dept. Agr. Madras, Rpts. Anakapalli Agr. Sta., 1914–15, pp. 6; 1915–16, pp. 7; 1916–17, pp. 12*).—Cultural, rotational, and variety tests with cotton, sugar cane, rice, and miscellaneous native crops are briefly noted, together with meteorological data for the period of 1914 to 1917, inclusive.

Grains for western North and South Dakota, F. R. Babcock, J. H. Martin, and R. W. Smith (*U. S. Dept. Agr., Farmers' Bul. 878 (1917), pp. 21, figs. 9*).—Approved methods of grain production in western North and South Dakota and eastern Montana are outlined, and varieties of winter and spring wheat, oats, barley, rye, and flax deemed suitable for the region recommended.

Grains for the Utah dry lands, J. W. Jones and A. F. Bracken (*U. S. Dept. Agr., Farmers' Bul. 883 (1917), pp. 21, figs. 8*).—This outlines approved methods for the production of the small grain crops on the Utah dry lands and recommends varieties of winter and spring wheat, oats, barley, and winter emmer deemed suited to the region. Corn, the grain sorghums, proso millet, and flax are said to be little grown.

The information presented in based largely upon the results of experimental work at the Nephi substation, previously noted (E. S. R., 32 p. 525; 36, p. 528).

Leguminous crops in desert agriculture, A. and Gabrielle L. C. Howard (*Agr. Jour. India, 12 (1917), No. 1, pp. 27–43; Fruit Expt. Sta. Quetta Bul. 6 (1916), pp. 15*).—The economic necessity of producing leguminous forage crops in the desert areas of India, to be used both for feed and for green manuring, is discussed. Tests with the drying and baling of shaftal (*Trifolium resupinatum*) and of alfalfa are noted, and the feeding value of the two crops compared, together with numerous reports on practical feeding tests in the Army.

A feeding analysis shows the nutritive ratio of shaftal to be 1:3.2 and that of alfalfa 1:3.5.

Comparative value of legumes as green manures, M. O. JOHNSON, ALICE R. THOMPSON, and C. A. SAHR (*Hawaii Sta. Press Bul. 52 (1917), pp. 14, figs. 6*).—This is a popular discussion of the studies of leguminous crops for green manuring purposes in Hawaii previously noted (E. S. R., 37, p. 320).

Soy beans and cowpeas, J. R. FAIN and P. O. VANATTER (*Ga. State Col. Agr. Circ. 46 (1917), pp. 8*).—A brief popular description of soy beans and cowpeas, together with cultural directions, recommendations as to varieties, and notes on the utilization of the crops.

Field production of yautias, gabis, and dasheens, G. O. OCFEMIA (*Philippine Agr. and Forester, 5 (1916), No. 7, pp. 223–234*).—This reports cultural tests with the crops named under conditions prevailing in the Philippine Islands. A brief review is given of cultural practices in the United States, Porto Rico, Hawaii, Barbados, New Caledonia, Haiti, and Malaysia.

[Variety tests with alfalfa], W. P. BROOKS and E. F. GASKILL (*Massachusetts Sta. Rpt. 1916, pp. 57a, 58a*).—Continued tests of alfalfa varieties have led to the conclusion that common alfalfa from northern-grown seed is equal to the higher-priced Grimm, both in yielding power and in resistance to winterkilling. Siberian alfalfa obtained from South Dakota winterkilled.

Barley, J. T. PRIDHAM (*Dept. Agr. N. S. Wales, Farmers' Bul. 112 (1916), pp. 3–22, figs. 7*).—The cultivation and handling of barley in New South Wales is discussed in a general manner, together with an economic discussion by J. R. Davidson, of the production of malting barley.

The production of clover seed under irrigation in southern Idaho, L. C. AICHER (*Idaho Sta. Bul. 100 (1917), pp. 19, figs. 9*).—Cultural methods and field practices employed in the production of clover seed under irrigation in southern Idaho are discussed in detail. Clover seed is now produced from Washington County on the western border to Teton County on the east, with a range in elevation of from 2,200 to 5,500 ft. Practically all Idaho-grown clover seed is bought by eastern seed houses to blend with eastern- and foreign-grown seed because of its high color, purity, and vitality, factors said to be greatly influenced by the methods employed in its production. Yields of seed have varied from 4 to 8 bu. per acre for red clover, 6 to 7 bu. for alsike, and 6 to 6.6 bu. for white clover for 1914 to 1916, inclusive, and for different sections of the State. Cooperative action on the part of Idaho seed growers to encourage the sale of straight Idaho-grown seed in the United States is urged.

Increasing the yield of corn by crossing, D. F. JONES, H. K. HAYES, W. L. SLATE, JR., and B. G. SOUTHWICK (*Connecticut State Sta. Rpt. 1916, pt. 5, pp. 323–347, pls. 2*).—Extensive investigations with 50 first-generation hybrids of the highest-yielding varieties of flint and dent corn in Connecticut are reported in a continuation of work previously noted (E. S. R., 31, p. 331). The experiments were conducted cooperatively by the State and Storrs stations at Mt. Carmel and Storrs in 1914 and 1915 and at Mt. Carmel in 1916. The behavior of the first-generation crosses as compared with their parents is outlined and tabulated data presented showing the yields, the heights, and the number of days to tasseling and to maturity. The desirable crosses are noted and the general characters and special features of the hybrids discussed in detail.

The results, together with those obtained elsewhere, are deemed conclusive as to the value of crossing, without previous inbreeding, as a method for increasing the yield of corn. It is stated that of the 50 F_1 crosses, "88 per cent yielded more than the average, and of these 66 per cent yielded more than either parent. In time of ripening the first-generation crosses were on the average intermediate when compared with their parents. . . . This increase in

the rate of growth is considered to be fully as important under Connecticut conditions as any increase in yield.

"The highest yielding parents gave the highest yielding crosses, . . . but . . . there was apparently no relation between the yield of the parents and the increase in the yield of the cross. High average yielding parents gave as large increases, when stated in percentages, as low yielding parents. There was a tendency for the crosses whose parents differed in their ability to yield to give the greatest increase. This is also shown by the fact that the dent × flint crosses gave greater increases in growth than the flint × flint crosses.

"These facts bear out the assumption that hybrid vigor is not the result of an indefinite physiological stimulation, but merely the result of the bringing together of [the] greatest number of favorable growth factors. Crosses between varieties of diverse type therefore possess a greater total number of favorable growth factors than crosses between similar varieties, and hence give larger increases when crossed."

A statistical study of some indirect effects of certain selections in breeding Indian corn, H. L. RIETZ and L. H. SMITH (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 4, pp. 105–146, figs. 24*).—In connection with breeding experiments with high- and low-protein and high- and low-oil strains of corn, conducted at the Illinois Experiment Station and previously noted (E. S. R., 20, p. 531), the authors report observations upon what they term "the indirect effects" of the selections by a statistical investigation of changes in certain physical characters of the ears of corn, including length, circumference, weight, and number of rows of kernels. The study involved the preparation of 476 distinct frequency distributions, and tabulated data are presented showing the frequency distributions with respect to the physical characters of the ears for the four strains in the crop of 1914, and showing the type and variability of the four strains with respect to each character studied for 11 crops, 1905–1915, inclusive. Similar observations are recorded for the two-ear strains, 1908–1916, inclusive, the erect- and declining-ear strains, 1907–1916, inclusive, and for the high- and low-ear strains, 1907–1916, inclusive, with considerable tabulated data and numerous graphs illustrating the means and standard deviations for each character studied in the different strains of corn. The results of the observations are summarized as follows:

"It is found that four distinct types of corn as regards length, circumference, weight of ears, and number of rows of kernels on ears are so well established that we may assign orders of values to the means of these characters that persist with but few exception in such changes of environment as have been experienced in 11 years of planting, from 1905 to 1915. While a few slight but significant progressive changes have been noted, the selections for chemical composition from 1905 to 1915 have not changed decidedly the differences in mean values of these characters. In fact, we are unable to assert with any high degree of probability that the strains differ more or less with respect to these characters during the second half of the period 1905 to 1915 than during the first half.

"The standard deviations of the strains do not differ nearly so much compared to their probable errors as do the means, and it is not in general nearly so easy to discriminate among strains by the differences of standard deviations as by the use of means. There is one marked exception to this. in that we easily distinguish high-protein and high-oil from low-protein and low-oil strains by the differences in the standard deviations in weight of ears.

"No progressve change of consequence has taken place in standard deviations. The coefficients of variability, in comparison to their probable errors, differ

still less in a given season than the standard deviations, and there is no very general tendency for the coefficients of variability to maintain a definite order of values. That is to say, the differences of coefficients of variability of the four strains seem to be fairly well described, with certain exceptions noted in the paper, as random fluctuations.

"The upper ears have a significantly larger mean value in length, weight, and circumference than have the lower ears on the same stalks. The means with respect to weight, length, and circumference of single ears are in each case larger than the corresponding means for the lower ears of the same plat. The means with respect to weight and circumference are also in general larger than these means for upper ears of the same plat. However, strange as it may appear, the mean lengths of single ears are on the whole less than those of upper ears. A striking fact in the comparison of the single ears with the upper and lower ears is the greater standard deviation in the weight of single ears.

"Taken as a whole, there are no significant differences in [erect- and declining-ear] strains with respect to the characters considered. In view of the suggestion that ears are declining because of their greater weight, it is a fact of special interest that the declining ears are not on the whole heavier than the erect ears.

"The ears of the low-ear strain are on the whole significantly larger in mean length, circumference, and weight than those of the high-ear strain, but there are a few exceptions. In each of the eight years considered the mean number of rows of kernels on ears is larger for the low-ear strain than for the high-ear strain. The standard deviation of number of rows of kernels in each year is distinctly greater for the low ears than for the high ears, and the standard deviation of circumference of ears is in general larger for the low-ear strain than for the high-ear strain."

[Nitrate experiments on "Nili" maize] (*Min. Agr. [Egypt] Circs. 22 (1912), pp. 4; 43 [1913], pp. 4; 48 [1914], pp. 7; 71 (1915), pp. 11; 81 (1916), pp. 9*).—Experiments in the fertilizing of "Nili" maize with sodium nitrate and the so-called baladi and kufri manures are reported. These experiments have been conducted since 1911 and now embrace 50 demonstration farms in the three provinces of Gheezeh, Qaliubîa, and Menoofeeyeh. The results obtained in each province are tabulated, and the general conclusions are as follows:

The use of nitrate of soda in maize cultivation apparently increased the yield 4.5 ardebs (25.2 bu.) after berseem and 3.5 ardebs after wheat above the yield secured from the use of kufri or baladi manures. Acid phosphate had no immediate effect on the crop. The use of 150 kg. of sodium nitrate per feddan (315 lbs. per acre) is recommended for Gheezeh Province when applied in two installments, one at the time of thinning and the second at the time of hoeing. The best results were obtained when from 75 to 100 loads of baladi manure was applied at the time of plowing and the nitrate added as indicated, but if baladi manure is not available, from 150 to 200 kg. of sodium nitrate are recommended.

Cotton variety tests for boll-weevil and wilt conditions in Georgia, A. C. LEWIS and C. A. MCLENDON (*Ga. Bd. Ent. Bul. 46 (1917), pp. 5–34, figs. 3*).—Extensive variety tests with long-staple upland cotton and Sea Island cotton at numerous centers in Georgia are reported in an effort to ascertain the varieties best suited for growing under boll-weevil and wilt conditions. For southern Georgia, Lewis 63, Desoto, Council-Toole, Dillon (for sandy soils), and Dix-Afifi are deemed best, while Cleveland, Toole, and Cook proved well adapted to most sections of northern Georgia.

How to grow cotton in spite of the boll weevil, I. W. Williams (*Ga. Bd. Ent. Bul. 47 (1917), pp. 48, figs. 17*).—The production of cotton from locally adapted, pedigreed seed under the best cultural conditions is recommended as the most effective method of combating boll-weevil and plant disease pests. Blooming records of a number of varieties tested at Thomasville and Valdosta, Ga., are reported.

Methods of treating cotton seed for anthracnose and angular leaf spot are noted.

Some lint characters of Sea Island cotton, S. C. Harland (*Agr. Jour. India, 12 (1917), No. 1, pp. 115–120*).—This paper presents a brief discussion of such lint characters of Sea Island cotton as length, uniformity of length, weak fiber, and lint index and lint percentage, and their bearing on cotton selection. Summarized statements show the number of seeds necessary to be examined in respect to each character, and the probable error involved.

The author takes exception to the conclusions of Cook (E. S. R., 20, p. 439) in so far as the latter maintains that a high lint percentage implies light seed, and hence that continuous selection for high lint percentage is inadvisable, as light seed gives rise to plants lacking in vigor. Observations with Sea Island cotton are noted, the author maintaining that high lint percentage does not imply a low seed weight, that plants with a low seed weight do not give rise to progeny deficient in vigor, and that cotton selections having a high line index are usually found possessing a high lint percentage.

Notes on the destruction of cotton bushes by burning, F. R. Shepherd (*Agr. Jour. India, 12 (1917), No. 1, pp. 120, 121*).—This paper reports satisfactory results obtained with plowing under cotton stalks instead of burning them at La Guérite, St. Kitts. By pulling the stalks, rather than cutting them, and plowing them under from six weeks to two months previous to seeding, the risk of infection of the new crop with the leaf blister mite was apparently no greater than when the stalks were burned, while the soil derived marked benefit from the added organic matter.

Ten years' practical experience of Java indigo in Bihar, D. J. Reid (*Agr. Jour. India, 12 (1917), No. 1, pp. 1–26, pl. 1*).—Statistical data are presented and discussed for each year from 1904 to 1915, inclusive, regarding the production of Java indigo (*Indigofera arrecta*) and of the local Sumatrana strain in Bihar in an attempt to reestablish the industry on a satisfactory competitive basis with synthetic indigo production. Approved cultural practices and the nature and control of the wilt disease are briefly outlined.

Matkee, a green manuring plant, A. Ram (*Agr. Jour. India, 12 (1917), No. 1, pp. 161, 162, fig. 1*).—The leguminous weed matkee (*Æschynomene indica*) is briefly described, and its use as a green manure for tea estates and elsewhere outlined.

Culture tests with varieties of oats, 1909–1912, J. C. Larsen (*Tidsskr. Planteavl, 23 (1916), No. 5, pp. 701–756*).—The results of cooperative culture tests with varieties of oats conducted for four years are reported in detail in tabular form and discussed. A description of each of the varieties tested is given. The results of the tests are summarized in the following table:

Results secured in cooperative variety tests of oats grown on clay and sandy soil.

Varieties.	Yield per tönde-land (1.36 acres). Grain.	Straw.	Hull content.	Kernel weight.	Weight per tönde (4 bushels).
Clay soil:	*Cwt.*	*Cwt.*	*Per cent.*	*Mg.*	*Lbs.*
Sejr	40.2	60.6	25.4	36	144
Schlanstedt	39.9	64.5	25.8	37	138
Stjerne	39.7	54.8	25.6	34	137
Gul Næsgaard	39.1	60.0	25.3	38	140
Gulhvid Tystofte	38.9	60.3	27.1	34	140
Ligowo	37.4	55.8	24.7	38	143
Sandy soil:					
Graa	27.3	43.8	35.3	31	109
Stjerne	26.6	36.8	26.4	33	126
Guldregns	24.9	40.8	25.6	32	135
Gul Næsgaard	24.7	40.4	26.1	37	124
Schlanstedt	24.7	42.6	27.3	38	125
Sejr	24.6	40.6	27.4	35	131
Gulhvid Tystofte	24.4	39.5	28.7	34	127
Ligowo	24.2	36.5	25.9	38	132

The chemical composition of the different varieties is also given.

Harvesting, picking, thrashing, and storing peanuts, H. C. Thompson (*U. S. Dept. Agr., Office Sec. Circ. 81 (1917), pp. 6, figs. 4*).—Methods which have proved successful are presented for harvesting, picking, and thrashing peanuts and for storing the product on the farm or in warehouses.

The potato, A. W. Gilbert, M. F. Barrs, and D. Dean (*New York: The Macmillan Co., 1917, pp. XII+318, pls. 16, figs. 29*).—A book intended to give brief practical suggestions on the growing, breeding, and marketing of potatoes for both the farmer and the student. The chapters relating to breeding and varieties occupy a large proportion of the book, as these subjects are regarded as having received less attention in potato literature than cultural methods.

The application of correlation formulas to the problem of varietal differences in disease resistance.—Data from the Vermont experiments with potatoes, J. A. Harris (*Amer. Nat., 51 (1917), No. 604, pp. 238–244*).—A number of constants showing the relative correlation of disease resistance in potatoes to variety are reported. These figures were obtained by the author in connection with other studies involving a review of numerous experiments conducted by the Vermont Experiment Station in comparing varieties for susceptibility to early blight (*Alternaria solani*) (E. S. R., 31, p. 643), tuber rot (E. S. R., 17, p. 1078), and *Phytophthora infestans* (E. S. R., 29, p. 550).

The author maintains that the correlation coefficients presented justify much more definite conclusions than were drawn without such statistical analysis and, hence, demonstrate the usefulness of the biometric method in the preliminary stages of disease-resistance experiments, in which large numbers of varieties are being tested, and in which the mass of data is confusing. He concludes that the most careful individual analysis is not only desirable but essential, and that the statistical method should be supplemental.

Cooperative potato spraying, 1916, G. P. Clinton and F. E. Rogers (*Connecticut State Sta. Rpt. 1916, pt. 5, pp. 355–364*).—Spraying experiments conducted by the station and the New Haven County Farm Bureau in cooperation with farmers within the county to test the relative value of Bordeaux mixture and Pyrox in spraying Green Mountain potatoes for blight are reported. The estimated cost, yields, and gain or loss per acre for each treatment are shown in tabular form, and the conclusion is reached that homemade Bordeaux

was superior to Pyrox, due to the greater cost of the latter and the less beneficial results derived from its use.

The significance of hybrid selections with rice and how they are originated, L. Koch (*Teysmannia, 27 (1916), No. 9–10, pp. 502–519, pls. 3*).—Discussing the theory and practice of hybridization the author briefly reviews the work of Van der Stok (E. S. R., 26, p. 435), begun in 1907, in hybridizing rice varieties.

Early rice planting as a means for augmenting the supply of irrigation water, W. L. Mesman (*Arch. Suikerindus. Nederland. Indië, 25 (1917), No. 2, pp. 34–40*).—The author presents data showing the saving in irrigation water made possible by the early planting (before October 15) of early-maturing varieties of rice on dry seed beds, withholding irrigation until after transplanting into the open field. An increase of profits of about 50 per cent is claimed for this practice.

Population analyses and inheritance studies concerning self-sterility, self-fertility, and sterility in rye, N. Heribert-Nilsson (*Ztschr. Pflanzenzücht., 4 (1916), No. 1, pp. 1–44, figs. 3*).—The author reports observations on 242 parent plants and 114 of their progeny, all of which were subjected to various methods of isolation. The study consisted of population analyses giving the average percentage of fertility (the number of kernels per number of glumes) of the variety- and of the pedigree-populations and of inheritance studies where isolation had progressed through two or more generations.

Methods of isolation and isolating materials are briefly discussed. A part of the work was conducted with closed glass tubes (18 to 30 mm. in diameter) into which the spikes were inserted, the opening closed with cotton wrapped about the stem, and the glass tube fastened to a stake driven into the ground beside the plant. Other spikes were isolated by means of glass tubes the closed ends of which had been cut off and the opening covered with parchment. In order to compare glass- and parchment-isolation with "normal" isolation a few plants were grown in the open, where they were deemed adequately isolated by reason of the fact that the experimental plats were at least 2 km. distant from any other rye fields and the prevailing winds were from a direction from which there was no fear of foreign pollen infection.

Considerable data are presented to compare the different isolating methods. The setting of seed was noticeably depressed by artificial isolation, the average fertility amounting to 7 per cent for the normal, 4 per cent for the parchment, and 1 per cent for the glass-tube method.

Different populations exhibited certain peculiar differences in regard to the average fertility percentage, while hybrid populations were even more variable than the parent and attained a higher fertility percentage. This was illustrated in the hybrid strains Brattingsborg × Petkuser and Brattingsborg × Heinrich, which gave an average fertility percentage of 7.7 with normal isolation and 2.6 with glass-tube isolation. Petkuser populations, on the other hand, and individual selections from Petkuser and Brattingsborg gave an average fertility of 0.5 per cent with glass-tube isolation and 3.8 per cent with normal isolation.

Inheritance studies demonstrated that rye populations contain strongly self-sterile, partly self-sterile, and self-fertile individuals. In the population receiving the most exhaustive study, an individual selection of Petkuser rye, of 73 plants observed 71 were self-sterile, 1 partly self-sterile, and 1 self-fertile. The appearance of a self-fertile race was held to indicate that the character of self-fertility was monohybrid, with self-sterility dominant. Self-fertile races must therefore be immediately constant upon their appearance, this having been demonstrated in one race through three generations. The self-fertile plant mentioned above had a fertility percentage of 74.8 with normal isolation. Its

progeny showed 57.4 per cent fertility with normal isolation and 14.8 per cent with glass-tube isolation. Four races have been observed which can be expected to show as high fertility. Normal fertility with Petkuser rye from cross-pollination, according to Ulrich (E. S. R., 14, p. 756), is 80 per cent.

Plants were also found which showed a high fertility percentage but somewhat lower (10 to 20 per cent) than that for the races noted above. These strains, however, have been observed through only two generations and consist of a small number of individuals. The author suggests that such plants be designated as "half-fertile" to distinguish them from those of higher fertility.

Individual plants setting from 10 to 20 per cent of seed have been observed to produce only self-sterile progeny. They are to be considered, therefore, as partly fertile modifications, or as extreme plus-variants of ordinary self-sterility. Only through inheritance studies, therefore, is the genotypic nature of partly fertile plants to be determined. Modifications which show such high percentages of fertility as that of the high-fertility races have not been observed.

The fertility percentage of high-fertility races did not appear to be depressed by isolation, although a marked retrogression in the quality and vitality of the seed and in the vitality of the progeny was observed. The plants remained rather vigorous after the second isolation but after the third were almost dwarfed. Whether strains of high self-fertility could be maintained for agricultural purposes is still regarded as questionable. These races have the advantage of being practically independent of meteorological conditions, but in every case observed the inferior quality of grain occasioned by isolation has been permanently established in the cross-pollinated progeny so that any advantage is apparently accompanied by this serious disadvantage. The author concedes, however, that differences between these races, in respect to this character, may be encountered, and that through hybridization the vitality of the race might be established without losing the advantages of self-fertility. The progeny of such a hybrid must be constantly self-fertile, since it arises from races having the same recessive character.

The author notes the progress of experiments planned for further study of the inheritance of sterility in an effort to determine whether this character lies solely in the ovule or is also expressed in the pollen grain.

Grain sorghum seed, E. B. BABCOCK (*California Sta. Circ. 177 (1917), pp. 8, figs. 6*).—This is a popular discussion of the principles and methods of seed selection for the improvement of grain sorghums, together with simple directions for field selection and for testing individual plant selections.

The purification of soy bean varieties, D. F. JONES and H. K. HAYES (*Connecticut State Sta. Rpt. 1916, pt. 5, pp. 348–353*).—Variations in plant habit and in flower and pod color observed in a variety of soy beans grown at the station in 1913 led to individual plant selections within the variety during 1914. Differences in height, number of pods, color and shape of seed, yield, time of flowering, color of flowers, and habit of growth were noted for 23 selections. Similar observations of selected plants within a strain grown as Ito San indicated that the variety was quite pure.

It is concluded that "these results simply show that a mixed variety of soy beans can be purified and made uniform by selecting individual plants and increasing their progeny."

Harvesting soy-bean seed, W. J. MORSE (*U. S. Dept. Agr., Farmers' Bul. 886 (1917), pp. 8, figs. 7*).—Directions are given for harvesting, curing and handling, thrashing, and storing soy beans when grown for seed.

The sugar beet in Algeria, VERMEIL (*Bul. Agr. Algérie, Tunisie, Maroc, 22 (1916), No. 2–6, pp. 29–34*).—A general discussion of sugar beet production in Algeria, together with tabulated data comparing six varieties.

The action of copper arsenate and arsenious acid on sugar cane roots, E. JARVIS (*Queensland Agr. Jour., n. ser., 7 (1917), No. 2, pp. 79, 80*).—This is a preliminary report of the effect of copper arsenate and arsenious acid on sugar cane roots when used as a poison bait for grubs.

Short "sets" of "badila" cane planted in earthenware pots, representing treatments of 113 and 226 lbs. of Paris green per acre, produced shoots which at the end of six weeks averaged 10 in. in height as compared with 7.5 in. for untreated checks. A maximum growth of 27 in. was attained in the pot representing a 226-lb. application. The average height of cane attained after six weeks' growth with from 100- to 200-lb. applications of commercial white arsenate was 27.8 in., as compared with 26 in. for the untreated check.

Concerning the progeny of plus and minus variants from pure lines of tobacco, H. JENSEN (*Proefstat. Vorstenland. Tabak* [*Dutch East Indies*], *Meded. 24 (1916), pp. 41–56, pls. 2; abs. in Internat. Inst. Agr., Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 5, pp. 720–722*).—Observations are reported on the offspring of large and small plants (3.9 to 7.3 ft. in height) and of wide- and narrow-leafed plants.

The results with different-sized plants indicated that large and small mother plants of a pure line produce offspring of the same height. Two pure lines were observed in regard to leaf width, one producing offspring which fluctuated around the parent plant (that is, around the plus or minus variants), while plus variants of a pure line, known as the WY-line, produced offspring having as narrow leaves as the minus variant.

Planting tests with tobacco, O. DE VRIES and E. SIDENIUS (*Proefstat. Vorstenland. Tabak.* [*Dutch East Indies*], *Meded. 27 (1916), pp. 85*).—This reports tests to determine the effect of different planting distances upon (1) yield as expressed by grams per plant, kilograms per plat, and percentage of first-length leaves, and (2) quality and color. The tests were conducted at a number of centers from 1910 to 1915 and included seven different planting distances.

The results obtained indicated that the yield per plant was least with close planting, while the greatest variation in individual plants was obtained in the wide plantings. The highest yield per plat was obtained from close plantings. Greater leaf length was obtained from wide plantings. In regard to quality and color, the best results were reported from close plantings on good soils, the improved quality and color, together with increased yield, fully compensating any loss in length.

[Report of field experiments with tobacco, 1898–1911], M. RACIBORSKI, H. JENSEN, and O. DE VRIES (*Proefstat. Vorstenland. Tabak* [*Dutch East Indies*], *Meded. 5 (1913), pp. 79–121, 131–136, 138–196, 199–215, pls. 14, figs. 6*).—Selections within pure lines, the testing of new varieties, and hybridization studies are reported, the latter being discussed at some length and the results obtained from numerous crosses illustrated. Extensive field experiments are reported pertaining to the seed, development of the seedling, various systems of seed-bed management, studies of the plant in the field, green manuring, use of stable manure, irrigation, influence of different factors on tobacco culture, fermentation studies, and combustion studies.

A report of tobacco studies near Deli, O. DE VRIES (*Proefstat. Vorstenland. Tabak* [*Dutch East Indies*], *Meded. 6 (1914), pp. 20–30*).—Climatic conditions, cultural practices, fermentation processes, and marketing facilities encountered in the course of tobacco investigations near Deli are briefly reviewed.

Tobacco culture, R. A. W. SOESMAN (*Proefstat. Vorstenland. Tabak* [*Dutch East Indies*], *Meded. 13* [*1915*], *pp. 10, pls. 4*).—Field practices in tobacco cultivation on the Crown lands of the Dutch East Indies are described in some detail.

The influence of green light upon the drying of tobacco leaves, H. JENSEN (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 10 [1914], pp. 14–22, fig. 1*).—Laboratory and field experiments are outlined for the purpose of determining the relative influence of white and green light upon the curing of the lower and upper leaves of tobacco as compared with leaves cured in darkness.

The general conclusion is drawn that light has comparatively little influence on the quality and color of the leaf, and that its importance has been greatly overestimated. Average percentages of brown leaves in samples of lower leaves are given at 74.87, 75.69, and 77.5 for white, green, and dark chambers, respectively. Similar data for samples of upper leaves show 90.98, 90.37, and 89.45 per cent of brown leaves.

Observations on the combustion of tobacco, E. SIDENIUS (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 22 (1916), pp. 25–69, pls. 2; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 8, p. 1119*).—Chemical analyses of the ash from good and poor qualities of tobacco and from the lower, middle, and top leaves of plants grown at different points are presented in tabular form, together with numerous fertilizer tests on field plats and with individual plants, and irrigation tests.

The general conclusion was reached that the properties of the soil and climate have a predominating influence on combustibility which special fertilizer treatment does not remedy. In one case reported potassium fertilization gave good results, but required such large amounts of fertilizer (20 gm. of potassium nitrate per plant) as to be practically prohibitive. Injection of potash salts into plants was without positive results. Application of horse manure in one experiment produced a serious decrease in combustibility.

Analyses of the leaves from different parts of the plant showed that combustibility was highest in the bottom leaves, decreasing as the top leaves were approached. This was specially true when the rains did not occur until late in the season. Supplementary irrigations were found to occasion considerable loss in combustibility.

Tests of winter wheat (*Connecticut State Sta. Rpt. 1916, pt. 6, pp. 428, 429*).—The following varieties of wheat have proved to be hardy when exposed to severe winter conditions in Connecticut: Dawson Golden Chaff, Fultz, Maryland Flint, Dietz Longberry, Early Genesee Giant, Rocky Mountain, Jones Winter Fife, Bearded Winter Fife, New Amber Longberry, Martin Amber, Poole, Fultzo-Mediterranean, Mammoth Red, Stover, and Klondike.

Wheat, C. F. NOLL (*Pennsylvania Sta. Bul. 148 (1917), pp. 3–15, fig. 1*).—Tests with 13 varieties of winter wheat for the 10-year period of 1906–1916 and with 33 varieties and selections for the period of 1913–1916 are reported, and the varieties briefly described in tabular form. Milling and baking tests conducted during 1910 and 1914–1916, inclusive, are also noted.

Dawson Golden Chaff gave the highest average yield for the 10-year period, amounting to 34.5 bu. per acre, while Fulcaster Selection 44–09 was highest for the shorter period, with an average yield of 40.4 bu. per acre. Harvest King, with 31.9 bu., and Currell Prolific, with 40 bu. per acre, respectively, were second for the two periods, while Fultz gave the lowest average yield for the 10-year period, 29.7 bu., and Eclipse for the shorter period, 28.5 bu. per acre.

In the milling and baking tests, the flour from most of the varieties is said to have compared favorably with standard spring patent flour in bread-making qualities and yield. The 1910 tests included Dawson Golden Chaff, Reliable, and Fulcaster, the last-named making the largest loaf and giving the best quality of bread.

Tests with Miracle wheat in 1912 sown at 1- and 2-bu. rates gave yields of 25.5 and 30.8 bu. per acre, respectively. In 1914 other samples of the same variety, designated as Marvelous, were sown at 1-, 3-, 6-, and 8-pk. rates and yielded 23.8, 33.1, 36.5, and 34.8 bu. per acre, respectively. The variety failed to tiller more than the majority of the other varieties tested.

Marquis and Minnesota 169 spring wheats were sown in 1915 and 1916 and gave average yields of 13.1 and 13.2 bu. per acre, respectively. In 1916, 32 commercial varieties of oats were grown with the wheats, giving an average yield of 70.1 bu. per acre. Winter wheat grown these two years averaged 32.6 bu. per acre for 30 commercial varieties. The spring wheat is said to have been shriveled and of poor quality and is deemed unsuited for Pennsylvania conditions.

Wheat culture in Pennsylvania is outlined and the principal insect and disease enemies of the crop briefly discussed.

Wheat culture, T. B. Hutcheson and T. K. Wolfe (*Virginia Sta. Bul. 216 (1917), pp. 15, figs. 3*).—Approved methods of wheat production are outlined and limited tests noted with dates, rates, and methods of seeding and with fertilizers.

Fulcaster, Dietz Amber, and Stoner bearded wheats and Fultz, Leap Prolific, and Harvest King smooth varieties are deemed best for Virginia conditions.

Seed treatments for the loose and stinking smuts of wheat are noted.

Wheat growing in the Southeastern States, C. E. Leighty (*U. S. Dept. Agr., Farmers' Bul. 885 (1917), pp. 14*).—An increased acreage of wheat is recommended for Tennessee, North Carolina, Mississippi, Alabama, Georgia, and South Carolina as a means of crop diversification and of providing home-grown bread. The sandy loam, silt loam, loam, and many clay soils when drained, well tilled, and fertilized are deemed suitable for wheat production, while the lighter, sandy soils, especially in the Coastal Plain, are regarded as better adapted for rye. The soft, red, winter wheats are thought best from all standpoints. Crop pests (insects, diseases, and weeds) are briefly noted and approved methods of control outlined. The value of wheat as a nurse crop, for hay, and for fall and winter pasture is also indicated.

[Cultural experiments with wheat growing], W. J. Spafford (*Jour. Dept. Agr. So. Aust., 20 (1916), No. 4, pp. 278–280; 20 (1917), No. 7, pp. 550, 551*).—Experiments conducted by T. Griffin since 1908 with different cultural treatments of wheat grown under dry-farm conditions are briefly reported.

The results for the period of 1908–1915 indicated that on subpacking land before seeding there was no increase over land not subpacked, and that with subpacking immediately after plowing the average increase in yield was only 1 bu., not deemed sufficient to encourage the practice. Tests in 1915–16 included a comparison of rolling and subpacking on 6-in. plowing and on 3-in. plowing, and of land cultivated at plowing time and then treated as ordinary plowed fallow. The results for 1916 indicated that there was practically no difference in yield between subpacking and rolling, the yields being approximately 20.6 and 19.8 bu., respectively, for the 6-in. plowing, and 18.06 and 18.7 bu., respectively, for the 3-in. plowing. Land cultivated at plowing time and treated as fallow gave a yield of 17.2 bu.

The seeds of cultivated plants and their identification, L. Francois (*Ann. Sci. Agron., 4. ser., 4 (1915), No. 1–6, pp. 30–55; 5 (1916), No. 1–6, pp. 207–295, figs. 121*).—This is an extensive discussion of the functions of the seeds of cultivated plants, together with tables and illustrations for their identification.

Report of seed tests for 1916, C. H. Waldron and Alma I. Stone (*Bul. N. C. Dept. Agr., 37 (1916), No. 9, pp. 74*).—A detailed report of the analysis of 1,345 samples of farm seeds and 372 samples of vegetable seeds for the year 1915–16.

Heating seed rooms to destroy insects, E. G. MONTGOMERY (*Jour. Amer. Soc. Agron., 9 (1917), No. 3, pp. 105–108, fig. 1*).—This paper describes a method for heating seed rooms to destroy insects, as devised and used by the department of farm crops at Cornell University. By using half-bushel grain receptacles having perforated metal tops and bottoms a temperature of 120° F. can be attained in a half bushel of grain within 5 to 6 hours with a room temperature of 130°. The treatment was found sufficient to kill mice as well as insects in all stages of development without any injury to the germinability of the grain.

HORTICULTURE.

Saving vegetable seeds for the home and market garden, W. W. TRACY, SR. (*U. S. Dept. Agr., Farmers' Bul. 884 (1917), pp. 16, figs. 5*).—This publication gives directions for saving the seed of our garden vegetables. The subject matter is discussed under the general headings of present shortage of vegetable seeds, how the supply may be increased, plants which bear seed the year they are planted (annuals), plants which require a winter rest before producing seed (biennials), and labeling, fumigating, and storing vegetable seeds.

Control of diseases and insect enemies of the home vegetable garden, W. A. ORTON and F. H. CHITTENDEN (*U. S. Dept. Agr., Farmers' Bul. 856 (1917), pp. 70, figs. 82*).—This publication discusses plant diseases and insects, prevention of diseases and insect infestation, formulas for fungicides and insecticides, mechanical methods of control, spraying methods, general crop pests and diseases, and the principal garden crops and the insects and diseases that attack them.

[Experiments with vegetables] (*Pennsylvania Sta. Bul. 147 (1917), pp. 31–34, figs. 3*).—A brief statement of progress made in investigations with cabbage, tomatoes, and asparagus, essentially the same as that noted in the previous report (E. S. R., 38 p. 40).

Home storage of vegetables, J. H. BEATTIE (*U. S. Dept. Agr., Farmers' Bul. 879 (1917), pp. 22, figs. 20*).—A popular treatise including directions for constructing storerooms and outdoor storage cellars, together with specific information for storing different kinds of vegetables and also apples.

First generation crosses in cucumbers, H. K. HAYES and D. F. JONES (*Connecticut State Sta. Rpt. 1916, pt. 5, pp. 319–322, pl. 1*).—An experiment to test the value of first generation crosses of cucumbers was started in 1912 when the following crosses were made: Early Russian×White Spine, White Spine×London Long Green, London Long Green×Fordhook Famous, and Fordhook Famous×White Spine. In view of the prevalence of mosaic disease in 1914 and in 1915, only the preliminary results secured in 1913 are given here.

The results for one season indicate that first generation cucumber crosses may frequently be expected to exceed the higher yielding parent in yield. The only cross that did not exceed the average of the parents in any character by an appreciable amount was the London Long Green×Fordhook Famous cross. The parents of this cross produced the same type of vine and same size of fruit, whereas the other three crosses were between parents differing in vine habit and in size of fruit.

Melon growing in Indiana, H. J. REED (*Indiana Sta. Circ. 68 (1917), pp. 16, figs. 14*).—This circular discusses the present status of the cantaloup and watermelon business in Indiana, and gives suggestons relative to their culture, harvesting and marketing, varieties, and the control of insects and diseases.

The effects of cross- and self-fertilization in tomatoes, H. K. HAYES and D. F. JONES (*Connecticut State Sta. Rpt. 1916, pt. 5, pp. 305–318, pls. 2*).—The

object of the experiment here reported was to test the value of first generation crosses in tomatoes and the effects of continued self-pollination within the variety. Four commercial varieties of tomatoes were used in the experiment, which was carried on during the four seasons 1912 to 1915.

The successive generations of self-fertilization reduced progressively both the yield and size of fruit in Best of All. The variety Stone was reduced in yield and increased in size of fruit, Dwarf Champion remained reduced in fruit size and increased in yield, and Lorillard remained increased in both fruit size and yield throughout the experiment. From these results it is concluded that self-fertilization of tomatoes simply isolates genotypic lines which may or may not exceed the original variety.

First generation crosses of Stone×Dwarf Champion and of Lorillard×Best of All were made each year. The Stone×Dwarf Champion crosses showed an average annual increase in weight of fruit and also in number of ripe fruits per plant of 8 per cent over the parental average and approached the fruit number of the better parent. The Lorillard×Best of All crosses showed an average annual increase in weight of fruit of only 3 per cent and no increase in number of ripe fruits over the parental average.

The increases in both size and number of fruits for the Stone×Dwarf Champion crosses ranged from 11 to 17 per cent during the four years and were sufficient to make the practice of growing first generation tomato crosses commercially profitable. These results, considered in connection with the less favorable results secured with the Lorillard×Best of All crosses, led to the conclusion that not all combinations of tomato varieties give the vigor usually derived from crossing, but when a desirable combination is found it can be counted on to give the increase in yield every time the cross is made.

Vigor due to crossing as measured by increased yield was not appreciably greater in crosses between artificially selfed parents than in crosses between ordinary commercial varieties. With the Stone×Dwarf Champion crosses, hybrid vigor also advanced the time of production before that of the earlier parent, thereby producing an opposite effect to that produced by favorable environmental conditions, which tend to delay maturity.

Report of orchard work on Mount Carmel Experiment Farm for years 1911 to 1916, inclusive, E. M. Stoddard (*Connecticut State Sta. Rpt. 1916, pt. 5, pp. 365–377*).—This comprises a statement of orchard work done by different departments of the station on the Mount Carmel farm for the years 1911 to 1916. The data given include a record of spraying, fertilizers, cover crops, cultivation, yield of fruit, and expenses and income in connection with the rejuvenation of a small old apple orchard. Similar data are also given for small apple and peach orchards started in 1911.

A comparison of different forms and combinations of phosphoric acid is being conducted in the peach orchard. The results thus far secured indicate that acid phosphate gives the highest yield and that lime is detrimental to the production of fruit.

Irrigation of orchards, S. Fortier (*U. S. Dept. Agr., Farmers' Bul. 882 (1917), pp. 40, figs. 39*).—A revised edition of Farmers' Bulletin 404 (E. S. R., 23, p. 440).

Experiments in the irrigation of apple orchards, E. P. Taylor and G. J. Downing (*Idaho Sta. Bul. 99 (1917), pp. 48, figs. 24*).—This bulletin describes experiments in the irrigation of apple orchards conducted in an apple orchard at Payette, Idaho, during the years 1913 to 1915, inclusive, and in an orchard at Twin Falls during the years 1914 to 1916, inclusive. In conducting the experiments special attention was given to the determination of the most economical amount of water to mature an apple crop, the relation of irrigation to the

formation of fruit buds, proper irrigation systems to produce apples of best keeping quality, the best irrigation scheme for the production of relatively large amounts of extra fancy and fancy fruits, and the influence of soil moisture upon the health of the tree as indicated by winter injury and blight. The results of the experiments are presented in a series of tables and charts and fully discussed. The investigation as a whole is summarized as follows:

"The trunk of an apple tree makes its growth during the first part of the growing reason. By August 1, 75 per cent of the total season's growth is completed. A cover crop greatly checks the rate of growth of the trunk. The trunk growth of Jonathan apple trees is directly affected by the amount of irrigation water applied during the first part of the growing season and by the percentage of water in the soil the preceding dormant season (winter). The latter factor may easily overbalance in its effect the former one.

"The terminal (limb) growth of Jonathan apple trees is practically completed by the first part of July. No growth is made after July 15. Irrigation after this date has no effect on the wood growth of the tree. As a general rule, the more irrigation water applied before July 1, the greater the terminal growth although the percentage of moisture in the soil the preceding fall and winter probably affects the terminal limb growth. A cover crop in an orchard greatly checks the limb growth of the trees.

"Jonathan apples grow very slowly from the time they are formed until about July 15, completing less than 30 per cent of their total growth during the first half of the total period they hang on the trees. Irrigation during this period (before July 15) will not increase the size of the apples. Jonathan apples grow most rapidly during the period starting about July 15 and ending about two weeks before picking time, when the rate of growth becomes considerably slower. Irrigation during this period of rapid growth has a very decided effect in increasing the size of the apples although it has practically no effect on the wood growth of the tree.

"Heavy irrigations in the spring tend to increase the wood growth of an apple tree and this tends to increase fire blight. A cover crop, preferably alfalfa, greatly decreases the wood growth and so lessens the amount of blight.

"Winter injury to apple trees, especially young trees, is usually the result of the wood of the tree not being thoroughly ripened or due to the ground being too dry during the winter. It is advisable to hold the water off during the latter part of the summer and let the wood ripen; then, if the fall is excessively dry, to apply a late dormant irrigation just before the ground freezes. Chlorosis or bunches of white leaves on apple trees is often a sign of overirrigation.

"Where two plats were given an equal total amount of water for the season, one early during the vegetative period of the tree and the other later during the fruit developing season, the last mentioned system invariably produced much the larger apples. Plats irrigated heavily early in the season produced heavy foliage which was detrimental to the development of color on the apples. Plats which were not forced to excessive leaf and wood growth during the vegetative period by early irrigation gave better color to the apples when given liberal applications of water during the period of most rapid apple growth. This experiment shows that fruit growers may, by irrigation, very materially augment color in fruit production if the water is applied at the right time. The plat which was given little irrigation early in the season (before July) and liberal applications during the period of most rapid apple growth (from July until two weeks before picking time) gave the highest percentage of extra fancy and fancy grades and also fruit of the best storage qualities. This plat (at Twin Falls, Idaho) with a dense clover cover crop was given a little over 2-acre feet of water during the entire season. An even

amount of water increasing as the season advanced to about two weeks before picking time gave apples of the best keeping qualities without sacrificing any of the crispness so essential to good apples.

"A dormant irrigation applied in the late fall just before the ground freezes is very essential and beneficial in most of the irrigated fruit districts of Idaho. From the time that the apples are picked until this time, the orchard should be allowed to dry out in order that the wood of the trees may become thoroughly ripened. The percentage of soil moisture in the late fall affects the percentage during the entire winter and early spring following. If an orchard is given this late dormant irrigation in the fall, the first irrigation the following spring may be put off considerably later than if the orchard went into the winter in a dry condition. This fall irrigation is very desirable.

"On the sandy soil in the Payette Valley, in a full bearing orchard of Winesaps and Jonathans with a clover cover crop, about 3 acre-feet of water per season gave the maximum results considering yield, grade, color, size, keeping qualities of the fruit, and the health of the tree. Here, also, the best results from the application of water were obtained when most of it was applied during the period of greatest apple growth."

Results from orchard fertilization (*Pennsylvania Sta. Bul. 147* (*1917*), *pp. 34–37, fig. 1*).—This comprises a brief summary of the results secured during the nine-year period from the orchard management experiments started by the station in 1907 (E. S. R., 35, p. 540; 38, p. 42).

The fertilizer experiments have shown in general that nitrogen is likely to be of most importance in orchards for improving both yield and growth. Thus far the nitrogen from commercial sources or from stable manure has proved more effective than that from cover crops. When slow-acting carriers of nitrogen are used no immediate effects should be expected before the following year. As indicated by experiments conducted elsewhere, applications of nitrate of soda about the time the buds are starting into growth in the spring or slightly later may materially influence the crop of the current season.

Neither phosphorus nor lime when used alone has exerted any important influence on either the yield or growth of apples in these experiments. The addition of phosphorus to nitrogen, however, has generally proved very beneficial. The gains from this combination in certain cases have exceeded 200 bu. per acre annually for the last nine years. It is pointed out that lime may be indirectly beneficial at times through its favorable influence on the growth of leguminous cover crops.

The rate of application now recommended for an acre of bearing trees consists of 150 to 200 lbs. of nitrate of soda and 250 to 300 lbs. of acid phosphate or their equivalents. For younger trees which are less likely to respond to fertilizers a good mulch of stable manure at the rate of 8 tons per acre is recommended. Potash has proved of material benefit in only one experiment. Fifty lbs. of the high grade muriate or its equivalent is now considered ample for an acre of bearing trees.

No fertilizer has materially improved the color of the fruit and those containing nitrogen have generally reduced it. This is probably due to delayed maturity, which has an advantage in the case of the more northern varieties, such as Baldwin, Hubbardston, and McIntosh, when grown in Pennsylvania. Lack of color in these varieties is readily overcome by delaying the picking. With varieties requiring a long growing season, such as the York Imperial, it may be necessary to utilize other aids to color, such as open pruning and sod culture, in order to overcome the detrimental effects of nitrogen. In certain orchards no kind of fertilization has yet proved beneficial.

The results secured from tests of cultural methods and cover crops in apple orchards during the last nine years indicate that in the absence of fertilization the mulch method generally gives the largest growth and the most fruit in young orchards, while the tillage and cover crop method has done slightly better in mature orchards. The greater efficiency of the mulch on the young trees is apparently connected with its greater moisture-conserving effects. In many cases the mulch can be readily grown between the tree rows in young orchards by the use of alfalfa and possibly also by the use of other plants. By this method many of the sloping foothill lands of the State which are not well adapted for tillage may be satisfactorily utilized in the production of fruit.

In the presence of proper fertilization there has been comparatively little difference in efficiency in tillage, tillage and cover crops, and proper sod mulch in their effects on the yield and growth of apples. Even the sod treatment when accompanied by fertilization of the right kind has been very satisfactory in many cases. Among the annual cover crops hairy vetch, soy beans, oats and Canada peas, buckwheat, and millet are now showing the best results in the order named. As compared with tillage alone, the addition of annual cover crops does not reveal much benefit, except possibly in seasons of abundant rainfall. The use of tilled intercrops with the appropriate fertilization followed by a winter cover crop of rye or rye and vetch has proved very satisfactory in the development of young orchards and has resulted in no apparent injury to the trees during the first nine years. Potatoes have done especially well in this connection and field beans, buckwheat, early cabbage, tomatoes, and other vegetables are believed to be worthy of special consideration in localities suited to their profitable production.

The planting and care of the young apple orchard, H. J. Reed (*Indiana Sta. Circ. 67 (1917), pp. 20, figs. 14*).—This circular contains practical suggestions relative to the cost of establishing an orchard, selection of varieties adapted for the home orchard and the commercial orchard, selection of nursery stock, preparation of the soil, planting operations, methods of pruning the young tree, and care of the young orchard.

Seed production in apples, C. S. Crandall (*Illinois Sta. Bul. 203 (1917), pp. 185–213, figs. 8*).—As a first step in a study of seed production in apples, this bulletin records the number of seeds produced in 31,972 individual fruits comprising the following four groups of apples, namely, large apples of orchard varieties, small apples of orchard varieties, crabs, and hand-pollinated fruits. Thirty-two orchard varieties and 25 species and varieties of the genus Malus are represented.

A study of the data as a whole shows that the average number of seeds in large apples of orchard varieties was 8.27; for small apples, 7.21; and for crab-like forms of Malus, 4.22. "The range in average seed production as exhibited by different varieties is wide with both orchard varieties and crab-like forms. Departures from the normal of five carpels to each fruit occur with both orchard varieties and crab-like forms, but are much more frequent with crabs than with orchard fruits. There are wide differences among individual varieties and species in seed-producing capacity, and the range in numbers of seeds in individual fruits is also wide. The assumed normal of 10 seeds to each fruit is likely to occur in a small percentage of orchard fruits, but rarely occurs in crab-like forms. Capacity to produce seeds appears as a varietal characteristic.

"Parthenocarpic fruits occur in orchard varieties and in species of Malus but not in very great numbers. There is great regularity in the appearance of ovules in normal numbers, that is, two in each carpel. Few cases of suppression of ovules occur; numbers in excess of normal are more common among orchard varieties than among crabs.

"Comparison of seed production in fruits developed from flowers open to pollination by insects and in fruits from hand-pollinated flowers brings out only small differences; apparently seed production is not dependent upon the manner in which pollination is effected. Considerable differences appear in seed production of individual fruits and of particular varieties, but averages of groups warrant the conclusion that the more highly developed orchard varieties exceed crabs in seed production and that, as between large and small fruits, large fruits produce the greater number of seeds."

The packing of apples in California, W. P. TUFTS (*California Sta. Circ. 178* (*1917*), *pp. 31, figs. 21*).—A practical treatise on packing house methods and equipment, with special reference to the box packing of apples.

Peach growing in Indiana, J. OSKAMP (*Indiana Sta. Circ. 69* (*1917*), *pp. 24, figs. 15*).—A practical treatise discussing the location of the orchard, planting, soil management, pruning, rejuvenation, varieties, winter and summer spraying, and enemies requiring special treatment.

Strawberry varieties and cultural hints, J. OSKAMP (*Indiana Sta. Bul. 200* (*1917*), *pp. 3-16, figs. 14*).—This bulletin briefly discusses the methods of growing, harvesting, and marketing strawberries, and gives a descriptive list of varieties that have been tested at the station grounds and directions for the control of insect pests and diseases.

Varieties of blackberries and raspberries with notes on their care, J. OSKAMP (*Indiana Sta. But. 201* (*1917*), *pp. 3-12, figs. 6*).—This circular contains popular instructions for the culture and care of blackberries and raspberries, including a descriptive list of varieties tested for five years at the station. Those varieties which have proved generally satisfactory over the State are indicated.

Mint growing in northern Indiana, C. B. SAYRE (*Indiana Sta. Circ. 65* (*1917*), *pp. 14, figs. 8*).—This circular deals with the culture of peppermint and spearmint in northern Indiana. It includes a discussion of soils, the establishment and care of a new plantation, harvesting, distilling the mint, disposal of the steamed hay, treatment of the field after harvesting, maintaining an established plantation, duration of a plantation, yields and returns, and insect pests and diseases.

FORESTRY.

[Report of the forestry section] (*Proc. 2. Pan Amer. Sci. Cong., 1915-16, vol. 3, pp. 481-502, 796-812, 815-834*).—The following papers read before the Second Pan American Scientific Congress, held at Washington, D. C., December 27, 1915, to January 8, 1916, are here presented in full: A Report on Forest Exploration in Southern Patagonia, by C. M. Hicken (pp. 481-483); South American Forest Resources and Their Relation to the World's Timber Supply, by R. Zon (pp. 483-492); The Lesson of Forestry in the Philippine Islands, by G. P. Ahern (pp. 492-502); The Attitude of the Government in the Matter of National Forests; Relation of Forest Culture to the Future Development of Central and South America, by E. L. Quirós (pp. 796-800), by R. Brin (pp. 801-805), and by H. Echegoyen (pp. 805-812); Forest Problems and Economic Development in South America, by R. Zon (pp. 815-822); and Scientific Forestry for Latin America, by B. Moore (pp. 822-834).

Report of the forester for 1916 (*Connecticut State Sta. Rpt. 1916, pt. 6, pp. 379-382*).—Data as to forest fires in Connecticut in 1916 are summarized.

Report of committee on forests, C. LEAVITT (*Com. Conserv. Canada Rpt., 8* (*1917*), *pp. 193-208, pls. 2*).—A review of various forest activities in Canada during 1916.

Annual return of statistics relating to forest administration in British India for the year 1915–16 (*Ann. Return Statis. Forest Admin. Brit. India, 1915–16, pp. 25, pl. 1*).—A statistical review for the year 1915–16 relative to the administration and management of the State forests of British India. A statement showing the revenues, expenditures, and surplus of the forest department throughout India during the 25 financial years from 1891–92, together with a diagram showing the annual forest revenues, expenditures, and surplus for the last 10 years, is included.

State forestry report for the year ended March 31, 1917, T. N. Brodrick et al. (*Ann. Rpt. Forestry Branch, Dept. Lands and Survey, New Zeal., 1917, pp. 41*).—A report on the administration and management of the State forests, nurseries, and plantations in New Zealand, including data on the timber cut, imports and exports, revenues, expenditures, etc.

A forest survey of the town of Redding, Conn., A. E. Moss (*Connecticut State Sta. Rpt. 1916, pt. 6, pp. 383–427*).—This report embraces the results of an intensive survey of the town of Redding, Conn., undertaken in the summer of 1915. Information is given relative to the commercial tree species, forest types, and character of the forest in different areas, together with suggestions relative to fire protection, improvement cuttings, and reforestation.

New Philippine shrubs and trees, E. D. Merrill (*Philippine Jour. Sci., Sect. C, 12 (1917), No. 5, pp. 263–303*).—The present paper consists, for the most part, of descriptions of 45 presumably new species of Philippine trees and shrubs.

Silvicultural notes on forest trees of Queensland (*Dept. Pub. Lands, Queensland, Forestry Bul. 3, pt. 1 (1917), pp. 27, pls. 4*).—This is the first of a series of bulletins dealing with the silviculture of the more important forest trees of Queensland. Ten species are considered in the present bulletin.

The forests and woods of Gabon, A. Chevalier (*Vég. Utiles Afrique Trop. Franç., No. 9 (1917), pp. VII+470, pls. 28, figs. 32*).—This comprises the results of an economic survey of the forests of Gabon, French Kongo, undertaken in 1912. The introductory chapters deal with the history of investigations of the flora of Gabon, the development of commerce in woods, and the discovery of the principal economic species. In the succeeding chapters the forests are described with reference to soil, climate, and distribution; the species observed are considered with reference to their nomenclature, distinguishing characteristics, economic uses, and habitat; and the woods are further classified according to their density and principal uses. The work concludes with suggestions relative to the establishment of a forest service in Gabon.

Notes on the timbers of Lukolela and of Eala, E. Leplae (*Bul. Agr. Congo Belge, 8 (1917), No. 1–2, pp. 99–101, fig. 1*).—The principal timbers of Lukolela and Eala on the Kongo are here classified according to their density.

A note on thitsi, Melanorrhœa usitata, with special reference to the oleoresin obtained from it, E. Benskin and A. Rodger (*Indian Forest Rec., 6 (1917), No. 3, pp. 31, pls. 5*).—An account of this species with reference to its common names, distribution and habitat, characteristics of the tree and timber, natural and artificial regeneration, method of tapping the trees, uses of the oleoresin, lacquer work of Burma, laboratory experiments, yield per tree and cost of extraction, and outturn from various parts of Burma and prices.

The influence of thinning out Hevea fields on the rubber yield per acre, P. Arens (*Arch. Rubbercult. Nederland. Indië, 1 (1917), No. 4, pp. 234–241; Meded. Proefstat. Malang, No. 19 (1917), pp. 7*).—Some data are given which indicate that rubber trees planted as close as 12 by 12 and 12 by 24 ft. may be thinned out to a distance of 24 by 24 ft. and thereby reduce the cost of tapping without any material decrease in yield per acre of rubber.

Note on the cubage of a sample plat in the virgin forest of Yangambi, central Kongo, E. Leplae (*Bul. Agr. Congo Belge. 8 (1917), No. 1–2, pp. 89–98, pl. 1. fig. 1*).—Height, circumference, and volume data are given for the standing crop on about five acres of forest, including over 50 different species.

A new dendrometer, D. Bruce (*Univ. Cal. Pubs. Agr. Sci., 3 (1917), No. 4, pp. 55–61, figs. 3*).—The dendrometer here illustrated and described consists essentially of a straight arm upon which are mounted two small mirrors, both at an angle of 45° with the axis of the arm, parallel to each other and facing in opposite directions. One mirror is fixed at one end of the arm, while the other is mounted on a slide which travels along the arm. Graduations permit a direct reading of the distance between the mirrors.

Emergency fuel from the farm woodland, A. F. Hawes (*U. S. Dept. Agr., Office Sec. Circ. 79 (1917), pp. 8*).—This circular discusses the necessity of supplementing the coal supply with wood, the relative heating value of wood and coal, methods of making cordwood, wood as a profitable farm crop, opportunity to improve the woodland, and community action regarding wood supply.

The substitution of other materials for wood.—Studies of the lumber industry, XI, R. Thelen (*U. S. Dept. Agr. Rpt. 117 (1917), pp. 78, figs. 28*).—This report, which was prepared under the direction of the Forest Service, comprises a compilation of all the data obtainable, even if not wholly complete or exact, on the replacement of lumber and wood in other forms. The report covers substitution in thirty or more forms of use, and conclusions and suggestions relative to substitution are presented.

Tanning materials from native sources in Latin-American countries, T. H. Norton (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 8, pp. 130–153, pls. 2, fig. 1*).—A paper presented at the Second Pan American Scientific Congress, held at Washington, D. C., December 27, 1915, to January 8, 1916, in which the author describes the occurrences of tannins in such woods, barks, leaves, excrescences, roots and bulbs, and fruits and seeds of the Latin-American flora as are actually or potentially of importance among the world's sources of tanning materials.

Dyestuffs from materials native to Latin-American countries, S. P. Sadtler (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 8, pp. 153–162*).—In this paper, read before the Second Pan American Scientific Congress, held at Washington, D. C., December 27, 1915, to January 8, 1916, the author briefly discusses the extraction of dyes from vegetable and animal sources, such as dyewoods and certain color-yielding insects, as compared with the manufacture of the synthetic or coal-tar dyes. The important dyewoods and dye-yielding plants of Latin-American countries are enumerated.

Seasoning of wood, J. B. Wagner (*New York: D. Van Nostrand Co., 1917, pp. XIII+274, pl. 1, figs. 100*).—A treatise on the natural and artificial processes employed in the preparation of lumber for manufacture, with detailed explanations of its uses, characteristics, and properties.

The preservation of shingles (*Pennsylvania Sta. Bul. 147 (1917), p. 38*).—No difference was observed in the lasting qualities of redwood, red cedar, and chestnut shingles and creosoted shingles of chestnut, southern yellow pine, and pitch pine after being laid nine years. Creosote treatment cost about 50 cts. per bundle.

Chestnut fence posts creosoted and set were found in good condition after ten years, while check posts were badly rotted.

Zinc chlorid as a preservative of structural timber, C. M. Spofford (*Trans. Nat. Assoc. Cotton Manfrs., No. 102 (1917), pp. 236–241*).—In this paper the author presents the results secured in a series of tests conducted during the last three years in the laboratories of the Massachusetts Institute of Technology, to determine the effect of the zinc chlorid or Burnettizing process of

preservation upon the strength of timber under varying conditions of time, temperature, and humidity. The tests are to be continued.

Practical wood preservation processes for prolonging the life of mill roofs, C. H. TEESDALE (*Trans. Nat. Assoc. Cotton Manfrs., No. 102 (1917), pp. 231–235*).—A short paper on this subject presented at the annual meeting of the National Association of Cotton Manufacturers at Boston, April 25 and 26, 1917.

DISEASES OF PLANTS.

Department of botany, A. V. OSMUN (*Massachusetts Sta. Rpt. 1916, pp. 59a–64a*).—A brief account is given of the various lines of investigation carried on by the department of botany, including studies of an anthracnose of shade trees due to *Glœosporium* sp. which is believed to be responsible for the disease on a number of different species of trees, spindling sprout of potatoes, an unusual rotting of potatoes due to *Phytophthora infestans* which was not accompanied by blighting of the vines, the overwintering of the white pine blister rust fungus on Ribes, injury to white pines apparently due to weather conditions, and outbreaks of downy mildew on greenhouse cucumbers; experiments which gave negative results with the potato powdery scab in Massachusetts; and tobacco and onion disease investigations.

The production of spores by Alternaria solani in pure culture, R. D. RANDS (*Phytopathology, 7 (1917), No. 4, pp. 316, 317, fig. 1*).—The author reports having been able to secure spore production by *A. solani* in pure cultures. The fungus was grown on hard potato agar for several days, then shredded and stirred, and the moisture relations controlled for 24 to 48 hours thereafter.

Puccinia subnitens and its æcial hosts, E. BETHEL (*Phytopathology, 7 (1917), No. 2, pp. 92–94*).—As a result of culture experiments, the author reports *P. subnitens*, the common rust of *Distichlis spicata*, as producing æcia on 22 species of plants embraced in 15 genera and 6 families.

Note on Xylaria polymorpha and X. digitata, J. R. WEIR (*Phytopathology, 7 (1917), No. 3, pp. 223, 224*).—The author reports having observed in 1906, near Scottsburg, Ind., *X. polymorpha* in diseased areas in living roots of a 4-year-old apple tree. In the same orchard in 1908, *X. digitata* was collected from the roots of a 6-year-old pear tree. In addition, the author reports collecting *X. digitata* from roots of *Populus trichocarpa* and *Cratægus douglasii* at Priest River, Idaho.

Grain smuts, D. B. SWINGLE (*Montana Sta. Circ. 70 (1917), pp. 4*).—Descriptions are given of oat and wheat smuts and treatments recommended for their control, as well as for smuts of other cereals.

Notes on the distribution of the bacterial disease of western wheat grass, P. J. O'GARA (*Phytopathology, 7 (1917), No. 3, pp. 225, 226*).—The disease of western wheat grass due to *Aplanobacter agropyri*, formerly reported in two counties in Utah (E. S. R., 36, p. 647), is recorded as occurring in three widely separated districts of Montana.

A bean disease introduced in diseased seeds, H. GARMAN (*Kentucky Sta. Circ. 16 (1917), pp. 91–95, fig. 1*).—A description is given of bean anthracnose, with suggestions for its control.

Factors affecting the parasitism of Ustilago zeæ, F. J. PIEMEISEL (*Phytopathology, 7 (1917), No. 4, pp. 294–307*).—The author reports a study of corn smut (*U. zeæ*) made to determine the vitality of the spores and sporidia, the effect upon them of placing corn in the silo, etc.

The infection of corn by *U. zeæ* is said to be purely local, no evidence having been found of systematic infection. When very young plants are attacked, they may be killed. Injury to the host plant, close planting, very early or

very late planting, and growth on very rich soil are conducive to attack, and vigorously growing plants between 2 and 3 ft. high are most susceptible.

The spores of *U. zeæ* can cause infection when either young or old. They germinate readily as soon as mature and retain their viability for several years. The spores, almost without exception, lost their viability after having been kept in a silo for a few weeks, a result brought about, it is thought, by the acids formed by the silage.

Drying and freezing temperatures were found to injure the sporidia very little. Alternate freezing and thawing, however, were injurious to moist sporidia, less so to desiccated sporidia. The optimum temperature for the budding of the sporidia was found to be between 20 and 26° C., the maximum at about 40°, and the thermal death point near 46°. The ability of sporidia, as well as of spores, to withstand unfavorable conditions is considered very significant in explaining some of the facts in the parasitism of *U. zeæ*.

The occurrence of Colletotrichum solanicolum on eggplant, P. J. O'Gara (*Phytopathology, 7 (1917), No. 3, pp. 226, 227, fig. 1*).—The author reports an attack by *C. solanicolum* on eggplants growing in a field which had produced potatoes the previous year.

Sclerotium bataticola, the cause of a fruit rot of peppers, W. H. Martin (*Phytopathology, 7 (1917), No. 4, pp. 308–312, figs. 10; abs. in ditto, 7 (1917), No. 1, p. 64*).—A disease of peppers is described which is characterized by the presence of numerous minute black sclerotia throughout the fruit as well as on the seed. A fungus which is identical with *S. bataticola* has been isolated from diseased material and grown in pure cultures. Successful cross inoculations have been made on peppers and sweet potatoes, as well as on cucumber, tomato, apple, and eggplant.

The pathogenic action of Rhizoctonia on potato, H. T. Güssow (*Phytopathology, 7 (1917), No. 3, pp. 209–213, fig. 1*).—According to the author, there is no satisfactory evidence demonstrating the pathogenic action of Rhizoctonia on its various host plants, particularly the potato. He has made a study of the subject from which he concludes that the destruction caused is largely due to injury to the feeding roots, and that the loss of the feeding roots in potato plants accounts for all the symptoms associated with this disease. This hypothesis is also believed to offer an explanation of the soil contamination and the persistence of the organism in land once infected.

Potato diseases in Indiana, H. S. Jackson and G. A. Osner (*Indiana Sta. Circ. 71 (1917), pp. 16, figs. 5*).—The authors describe the more common potato diseases known to occur in Indiana and offer suggestions for their control.

Bacillus morulans n. sp., a bacterial organism found associated with curly top of the sugar beet, P. A. Boncquet (*Phytopathology, 7 (1917), No. 4, pp. 269–289, figs. 7*).—In a previous publication (E. S. R., 34, p. 645), the occurrence of a bacterial organism in connection with the curly top disease of sugar beets was reported. In the present paper the author describes *B. morulans* n. sp. as the cause of the disease, and gives an account of his bacteriological investigations and the results of isolation experiments with the organism.

Lightning injury to sugar cane, J. A. Stevenson (*Phytopathology, 7 (1917), No. 4, pp. 317, 318, fig. 1*).—A description is given of the destruction by lightning of a small area of sugar cane in one of the fields of the Insular Experiment Station at Rio Piedras, P. R.

Studies on Bacterium solanacearum, E. E. Stanford and F. A. Wolf (*Phytopathology, 7 (1917), No. 3, pp. 155–165, fig. 1*).—Data are presented regarding the distribution within North Carolina of the disease of tobacco and tomato due to *B. solanacearum*, on cultural studies to determine the identity of the strains from the several hosts, and on the results of cross inoculations. The

wilt of tobacco has been observed in 11 counties of North Corolina and the tomato wilt caused by the same organism in 39 counties of the State. Cultural studies on the identity of the organism from various host plants showed that there was no greater variation in the strains from the different hosts than in strains all of which came from the same host.

As a result of cultural studies, the authors have added 13 species of plants to the known hosts of *B. solanacearum*, and it is claimed that 9 families are now known to be subject to attack. Attention is called to the economic bearing of weed and cultivated host plants in problems of control.

Buckeye rot of tomato fruit, C. D. SHERBAKOFF (*Phytopathology, 7 (1917), No. 2, pp. 119–129, figs. 5*).—A detailed account is given of a rot of tomato fruit in Florida locally known as buckeye rot, of which a preliminary report has been noted (E. S. R., 37, p. 651). The rot is said to be caused by *Phytophthora terrestria* n. sp., a technical description of which is given.

This disease occurs only on fruit that touches or nearly touches the ground, but may cause considerable injury to fruit in the field and in transit. Staking the plants in the field to remove the fruit as far as possible from the ground and holding the fruit for a few days before packing are methods of control suggested.

Phytophthora infestans, causing damping-off of tomatoes, J. E. HOWITT (*Phytopathology, 7 (1917), No. 4, p. 319*).—Attention is called to the damping-off of tomatoes due to *P. infestans*, at least 50 per cent of the plants from large nursery shipments to certain sections of Ontario having been destroyed in 1916.

Apple scab on the twigs, M. T. COOK and C. A. SCHWARZE (*Phytopathology, 7 (1917), No. 3, pp. 221, 222*).—The authors report the occurrence on apple twigs of *Venturia pomi* in the spring of 1916, viable conidia having been present in considerable abundance. The presence of the organism on the twigs is believed to have an important bearing on the infection of apples during the growing season.

Blister spot of apples and its relation to a disease of apple bark, D. H. ROSE (*Phytopathology, 7 (1917), No. 3, pp. 198–208, figs. 3*).—A disease of apple is described in which small blister-like spots are formed in the fruit of a number of varieties. The trouble is said to be due to *Pseudomonas papulans* n. sp.

As a result of inoculation experiments, the author has shown that this species of bacteria can also produce two forms of disease on the twigs and branches known as rough bark or scurfy bark canker. A preliminary comparative study of the culture characteristics of the organisms taken from the fruit and the bark suggests that the differences between them are of degree rather than of kind and that all three diseases are probably caused by one species of organism.

Apple diseases in Indiana, with spray schedule, H. S. JACKSON (*Indiana Sta. Circ. 70 (1917), pp. 23, figs. 14*).—A popular description is given of a number of the more common diseases to which the apple is subject, and a spray schedule is appended for the prevention of fungus and insect attacks.

A new leaf spot disease of cherries, B. A. RUDOLPH (*Phytopathology, 7 (1917), No. 3, pp. 188–197, figs. 3*).—A leaf spot of sweet cherries first observed by the author in 1913 has been investigated at some length and determined to be due to a fungus of close relationship to *Alternaria citri*, which is technically described as *A. citri cerasi* n. var.

Conspicuous spots are formed upon the leaves of cherry, the fungus usually gaining entrance to the leaf tissue through injuries made by insects. Inoculations on the bark and wood of normal cherry twigs gave negative results, but from inoculations upon cherry leaves characteristic spots were obtained, as also from inoculations on the leaves of a considerable number of other plants, embracing apple, box elder, prune, plum, avocado, watermelon, and peach.

The organism is considered a wound parasite only, and it can be distinguished from *A. citri* with difficulty.

The perfect stage of Glœosporium venetum, W. H. Burkholder (*Phytopathology, 7 (1917), No. 2, pp. 83–91, figs. 3*).—The author reports having observed a peculiar ascomycete while studying the anthracnose of the raspberry due to *G. venetum*. As the fungus was only found in connection with anthracnose lesions, further studies, made to determine whether there was any relation between the two forms, led him to conclude that the second fungus observed is the perfect stage of *G. venetum* and that it belongs to the genus Plectodiscella. The name of the fungus, based on the fact that it is the perfect stage of *G. venetum*, would be *P. veneta* n. sp. A technical description is given of the organism.

Some changes produced in strawberry fruits by Rhizopus nigricans, N. E. Stevens and L. A. Hawkins (*Phytopathology, 7 (1917), No. 3, pp. 178–184*).—The results are given of an investigation of the biochemical changes brought about in strawberry fruits by *R. nigricans*.

The effect of the fungus upon the various constituents of the strawberry is said to be much the same as that produced by other fungi on their host plants. The authors account for the loss of juice which occurs in strawberries attacked by *R. nigricans* as probably due to the fact that the fungus so affects the protoplasm of the cells that it is no longer capable of functioning as a semipermeable membrane.

End rot of cranberries, C. L. Shear (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 2, pp. 35–42, pl. 1, figs. 3*).—The author describes an end rot disease of cranberry due to *Fusicoccum putrefaciens* n. sp., which is said to have been found in all the cranberry-growing sections of the United States and which has occasioned considerable loss in the past few years, especially to the Late Howe variety. The rot is reported to start at either the blossom or the stem end of the berry, finally producing a soft rot of the fruit.

From circumstantial evidence, the author believes that the fungus, which is technically described, is genetically related to a species of Cenangium.

Spraying experiments in Massachusetts have shown that the disease may be largely prevented by the use of Bordeaux mixture. Some injury to cranberry vines has been observed associated with the application of Bordeaux mixture on the experimental plats in Massachusetts, but not elsewhere. The cause of the injury is being investigated.

A Rhizoctonia of the fig, J. Matz (*Phytopathology, 7 (1917), No. 2, pp. 110–118, pl. 1, figs. 3*).—A technical description is given of *R. microsclerotia* n. sp., the cause of a disease of fig in Florida. An account of the relation of the fungus to the leaf blight of fig has been noted (E. S. R., 37, p. 652).

Variations in Colletotrichum glœosporioides, O. F. Burger (*Abs. in Phytopathology, 7 (1917), No. 2, p. 151*).—From a study of cultures of *C. glœosporioides* isolated from different species of Citrus in California the author has grouped the strains into three classes, based on the mycelial characters as developed in artificial media.

Species of Melampsora occurring upon Euphorbia in North America, E. B. Mains (*Phytopathology, 7 (1917), No. 2, pp. 101–105*).—Technical descriptions are given of *M. euphorbiæ-gerardianæ, M. euphorbiæ, and M. monticola*, the last being a new species. All of these species are said to occur on Euphorbia in North America, but none of them had been reported in this country until within the past year.

Diseases of ornamental plants, D. C. Babcock (*Mo. Bul. Ohio Sta., 2 (1917), No. 10, pp. 323–328, figs. 4*).—A description is given of some of the more com-

mon diseases of a number of ornamental plants, with suggestions for their control.

Recent cultures of forest tree rusts, J. R. WEIR and E. E. HUBERT (*Phytopathology, 7 (1917), No. 2, pp. 106–109*).—Reports are given of inoculation experiments with a number of heterœcious rusts in which the host relationships of *Cronartium coleosporoides*, *C. comptoniæ*, *Melampsora medusæ*, *M. bigelowii*, *Pucciniastrum pustulatum*, *Gymnosporangium tubulatum*, and *G. nelsoni* were established.

Pycnial stages of important forest tree rusts, J. R. WEIR and E. E. HUBERT (*Phytopathology, 7 (1917), No. 2, pp. 135–139, figs. 2*).—The discovery of abundant exudations of pycnospores on *Pinus ponderosa* and *P. contorta* caused by *Cronartium comandræ* led the authors to make a study of the pycnial stages of *C. coleosporoides*, *C. comptoniæ*, and *C. cerebrum*. The pycnial stages of these fungi were found and technical descriptions are given of these forms.

In connection with these investigations, a species of Tuberculina was found attacking the pycnial and æcial stages of the different species of Cronartium on Pinus. The occurrence of the Tuberculina is said not to have been sufficiently abundant to indicate its economic importance.

Notes on Razoumofskya campylopoda, G. G. HEDGCOCK and N. R. HUNT (*Phytopathology, 7 (1917), No. 4, pp. 315, 316*).—As a result of inoculation experiments in which seeds of *R. campylopoda* from *Pinus sabiniana* were transferred to 18 species of Pinus and also to *Larix occidentalis* and *Pseudotsuga taxifolia*, the authors were able to establish the dwarf mistletoe on *Pinus banksiana*, *P. bungeana*, *P. caribæa*, *P. pinea*, *P. sabinana*, and *P. virginiana*. On *P. bungeana* and *P. virginiana*, dense witches' brooms were found around the mistletoe-infected regions. On the other species, spindle-shaped swellings were usually formed at the point of attack. All these species except *P. sabiniana* are said to be new hosts for this species of mistletoe in this country.

As the mistletoe is a western species which is able to attack vigorously a number of species of eastern pines, the authors call attention to the desirability of discouraging shipments of nursery stock from the Rocky Mountain and Pacific regions to those further east, because of the possibility of introducing the mistletoe to eastern plantations.

Witches' brooms on hickory trees, F. C. STEWART (*Phytopathology, 7 (1917), No. 3, pp. 185–187, fig. 1*).—A brief description is given of witches' brooms on the shell bark hickory (*Carya ovata*) caused by the fungus *Microstroma juglandis*.

A Nectria parasitic on Norway maple, M. T. COOK (*Phytopathology, 7 (1917). No. 4, pp. 313, 314*).—In a previous publication (E. S. R., 33, p. 249), the author called attention to an attack on Norway maple in 1913 by a species of Nectria. Later investigations have shown that the disease, although present in subsequent years, was much less severe than in 1913. Besides the Norway maple, the author has found the fungus attacking mulberry, on which it is apparently a weak parasite.

Sparassis radicata, an undescribed fungus on the roots of conifers, J. R. WEIR (*Phytopathology, 7 (1917), No. 3, pp. 166–177, figs. 5*).—A description is given of *S. radicata* n. sp., which is said to be widely distributed in the Northwest and often to attack the roots of *Pseudotsuga taxifolia*, *Picea engelmanni*, *Pinus monticola*, and *Larix occidentalis*. The mycelium of the fungus is said to attack the base of the roots and later the wood, producing a yellow or brown carbonizing rot.

Needle rust on Pinus resinosa, P. SPAULDING (*Phytopathology, 7 (1917), No. 3, p. 225*).—The author reports the occurrence in 1916 near Sharon, Vt., of

Coleosporium solidaginis and *C. delicatulum* on a plantation of about 10,000 trees of *P. resinosa*.

Contributions to our knowledge of the white pine blister rust, W. A. McCubbin (*Phytopathology, 7 (1917), No. 2, pp. 95–100, fig. 1*).—An attempt has been made by the author to determine the method of infection of the pine by *Cronartium ribicola*. A large number of infections were examined, from which it appeared that the chief mode of infection was by way of the leaf fascicles through the so-called short shoots.

Studies were made of the life cycle of the fungus on the pine, from which the author concludes that it has a 5-year cycle. The first season is a period of infection, followed by a dormant period during the second season, with swelling of the host tissues in the third and fourth seasons, and the formation of æcia in the fifth and following seasons. This outline of the life cycle is believed to obtain in the majority of cases, although it is not entirely invariable.

Early discovery of white pine blister rust in the United States, R. G. Pierce (*Phytopathology, 7 (1917), No. 3, pp. 224, 225*).—A brief note is given on the determination in 1905 by Mrs. F. W. Patterson, mycologist of the U. S. Department of Agriculture, of Peridermium on white pine. This record antedates previous reports on this fungus.

State and national quarantines against the white pine blister rust, P. Spaulding and R. G. Pierce (*Phytopathology, 7 (1917), No. 4, pp. 319–321*).—From a tabulated statement showing the quarantines that have been declared against the transportation of white pines as a prevention of the spread of the white pine blister rust, it is seen that 18 States, the United States, and Canada prohibit the movement of all white pines or the 5-leaved species, and in a number of instances the interstate movement of currants and gooseberries is also prohibited.

Synthetic culture media for wood-destroying fungi, E. J. Pieper, C. J. Humphrey, and S. F. Acree (*Phytopathology, 7 (1917), No. 3, pp. 214–220*).—Formulas are given for synthetic culture media for wood-destroying fungi such as Fomes, Lenzites, Stereum, etc.

The mononchs (Mononchus Bastian 1866), a genus of free-living predatory nematodes, N. A. Cobb (*Soil Sci., 3 (1917), No. 5, pp. 431–486, figs. 75*).—In a brief introduction the author states that a careful examination has fully demonstrated the predacious character of certain common and widely spread soil-inhabiting species, which are found to feed on other small animal organisms, such as protozoa and rotifers, and other nematodes, and has led to the determination that practically all mononchs are predacious. The evidence indicates that the nematodes destroyed are injurious to agriculture since all 14 species observed have proved to be carnivorous. Mononchs were formerly considered as harmful to vegetation, due (1) to the congregating about the roots and between the leaf sheaths of plants, especially succulent plants, and (2) to the fact that vegetable matter was often found in their intestines.

The first part of this work (pp. 433–453) is devoted to the structure, functions, and distribution of mononchs, which constitute a genus of free-living predatory nematodes inhabiting soil and fresh water, as well as the aboveground parts of certain plants. The second part (pp. 453–486) is devoted to a classification of the genus, including a table for the separation and descriptions of 60 species belonging to 6 subgenera, of which 31 are described as new. They appear to molt four times.

A bibliography of 50 titles is included.

Segmentation in nematodes: Observations bearing on the unsettled question of the relationship of nematodes to other branches of the animal kingdom, N. A. Cobb (*Science, n. ser., 45 (1917), No. 1171, p. 593, figs. 2*).

The cuprammonium washes, their preparation, biological properties, and application, O. Butler (*New Hampshire Sta. Sci. Contrib. 10 (1917), pp. 235–268, pls. 8; Phytopathology, 7 (1917), No. 4, pp. 235–268, pls. 8*).—The results are given of a study of the composition and preparation of the different cuprammonium washes, their relative toxicity and the conditions affecting the same, and the relative efficiency and effectiveness of these washes used as fungicides. The cuprammoniums met with in practice are cuprammonium sulphate, which is a very unstable product, and cuprammonium hydrate and cuprammonium carbonate, both of which are quite stable.

The author concludes that the cuprammoniums are more toxic when slowly than when quickly dried, their toxicity being due to soluble copper. When large amounts of soluble copper are required to give protection, the cuprammonium washes are preferable to Bordeaux mixture; but when small amounts of soluble copper are sufficient, the cuprammonium washes are said to be less effective than Bordeaux mixture so far as withstanding weathering and yielding soluble copper for protection against organisms are concerned, although the cuprammonium washes are more efficient with regard to the solubility of their copper and its toxicity in solution. The relative efficiency of the unit copper in the cuprammoniums in decreasing order is said to be as follows: Copper sulphate ammonia, malachite ammonia, copper sulphate ammonium carbonate, and malachite ammonium carbonate.

The cuprammoniums may be used at 11.7 times their lethal concentration for *Plasmopara viticola* on plants not affected by 0.0075 per cent of soluble copper. They are considered of limited practical applicability and should not be used in lieu of Bordeaux mixture whenever the latter yields sufficient soluble copper to give protection.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Life zone investigations in Wyoming, M. Cary (*U. S. Dept. Agr., Bur. Biol. Survey, North American Fauna No. 42 (1917), pp. 95, pls. 15, figs. 17*).—This report is based upon the results of natural history explorations conducted in recent years by field parties of the Bureau of Biological Survey in all the important physiographic areas of Wyoming. The first section characterizes the five transcontinental life zones represented in the State, defines their extent and limits, and discusses their economic possibilities. The second section consists of notes on the distribution and abundance of conspicuous trees and shrubs observed during the progress of the survey. An accompanying map shows in detail the extent and boundaries of the life zones which traverse the State.

The rat pest, E. W. Nelson (*Nat. Geogr. Mag., 32 (1917), No. 1, pp. 1–23, figs. 20*).—Attention is called to the economic importance of the rat.

A distributional list of the land birds of west central Oregon, A. C. Shelton (*Univ. Oreg. Bul., n. ser., 14 (1917), No. 4, pp. 51, figs. 11*).—This paper, which consists of an annotated list of 143 forms, includes a discussion and an illustrated outline of the life zones of west central Oregon.

Birdcraft, Mabel O. Wright (*New York and London: The Macmillan Co., 1917, 9. ed., pp. XXIII+317, pls. 80*).—The main part of this work consists of a synopsis of bird families (pp. 43–54) and bird biographies (pp. 55–279). Keys to the land birds, birds of prey, and game, shore, and water birds are appended.

Your bird friends and how to win them, J. H. Dodson (*Kankakee, Ill.: Author, [1917], pp. 24, figs. 46*).—Methods of attracting, housing, etc., of wild birds are described.

Bird houses (*Philadelphia: [Curtis Pub. Co., 1917], pp. 18, figs. 120*).—Illustrated plans are given for 60 devices for supplying shelter and food for birds.

Bibliography of Canadian zoology, E. M. WALKER (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 10 (1917), Sect. IV, pp. 201–215*).—One hundred and eighteen titles are listed.

Bibliography of Canadian entomology for the year 1915, C. J. S. BETHUNE (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 10 (1917), Sect. IV, pp. 169–187*).—One hundred and seventy-five titles are listed.

Index to the literature of American economic entomology, January 1, 1905, to December 31, 1914, compiled by N. BANKS (*Melrose Highlands, Mass.: Amer. Assoc. Econ. Ent., 1917, pp. V+323*).—In this index the literature of each subject is arranged alphabetically by authors.

Studies in insect life and other essays, A. E. SHIPLEY (*London: T. Fisher Unwin, Ltd., 1917, pp. XI+338, figs. 11*).—Papers on Insects and War; The Honeybee; Bombus, the Humblebee; On Certain Differences Between Wasps and Bees; and Grouse Disease are included.

The biological sciences applied to agriculture in the control of insect pests and plant diseases in the United States, P. MARCHAL (*Min. Agr. [France], Ann. Serv. Épiphyties, 3 (1914), pp. 31–382, figs. 156; rev. in Science, n. ser., 45 (1917), No. 1169, pp. 503, 504*).—This is a report upon an inspection trip made by the author during 1913 in which he deals with the work of several of the bureaus of the U. S. Department of Agriculture, particularly the Bureau of Entomology (pp. 52–199), the experiment stations, etc.

Nineteenth annual report of the State entomologist for 1916, E. L. WORSHAM (*Ga. Bd. Ent. Bul. 48 (1917), pp. 36, pl. 1*).—This report of the work of the year deals particularly with the boll weevil, which, by November, 1916, had appeared in 116 counties in the State. Among other insects, work with which is reported, are several pecan pests, including the pecan case bearer (*Acrobasis nebulella*), which is responsible for more injury to the pecan than any other insect; the nut case bearer (*A. hebecella*), which destroyed 50 per cent of the crop in one grove but is still confined to the vicinity of Thomasville and Cairo; the shuck worm (*Enarmonia caryana*), which is probably the most widespread of the species attacking pecans, occurring throughout the State; aphids (*Monellia costalis* and *Monellia* sp.) ; and the fall webworm.

[Report of the] department of entomology, H. T. FERNALD (*Massachusetts Sta. Rpt. 1916, pp. 78a, 79a*).—This is a brief statement of the occurrence of the more important insects and of the work of the year.

Observations of the strawberry crown girdler in a forest nursery, a serious outbreak of which was recorded the previous year (E. S. R., 36, p. 156), indicated that the period of extensive destruction at that place was drawing to an end and that the methods of treatment then recommended were to a large degree successful in checking further injury.

Work connected with insect and fungus pests and their control (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Antigua, 1915–16, pp. 15–17*).—Observations during the year indicate that the scoliid parasite *Tiphia parallela* of white grubs has become established in Antigua. Brief mention is made of insects attacking cotton, yams, limes, onions, etc.

Report on insect pests in Finland for 1913, W. M. LINNANIEMI (*Landtbr. Styr. Meddel. [Finland], No. 99 (1915), pp. 68, pl. 1, figs. 23*).—This reports upon the occurrence of and work with the more important insect pests in Finland during 1913.

Work of the Kief station in the control of insect pests in 1914, V. V. DOBROVLÏANSKIĬ (*Otchet Radotakh Ent. Otd. Kiev. Sta. Borbi͡e Vred. Rast., 1914, pp. 41, figs. 5*).—A summary of work carried on at the Kief station, especially

with the Swedish or frit fly (*Oscinella frit*), the winter cereal fly (*Leptohylemyia coarctata*), insecticides, etc. Examinations made of the stomach contents of moles are also reported upon.

Report of the imperial entomologist, T. B. Fletcher (*Rpt. Agr. Research Inst. and Col. Pusa, 1915–16, pp. 58–77; abs. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 3, pp. 124–126*).—This reports upon the occurrence of and work of the year with insect pests in India.

Economic zoology (*Ann. Rpt. Bd. Sci. Advice India, 1915–16, pp. 152–176*).—Under the heading of agricultural entomology (pp. 152–173), T. B. Fletcher deals with the occurrence of and work with insect pests in Pusa, the Provinces, and native States, including a list of publications on entomology. Forest entomology is dealt with by N. C. Chatterjee (pp. 173–176).

Pests and diseases of New Zealand flax, D. Miller (*Jour. Agr. [New Zeal.], 14 (1917), No. 6, pp. 431–439, figs. 2*).—This is a progress report of studies of the life history and methods of control of *Xanthorhoe præfectata*, the larvæ of which damage the leaf and fiber of New Zealand flax (*Phormium tenax*), and of other insects which incidentally were found to do considerable damage to flax. Those reported upon are *Melanchra steropastis*, the larvæ of which cut notches from the edge of the leaf and are most abundant upon the hill flax; *Œceticus omnivorus*, the larvæ of which remove the lower epidermis of the flax leaf in circular patches; etc.

Paddy pests in Travancore (*Trop. Agr. [Ceylon], 48 (1917), No. 6, p. 362*).—The rice bug (*Leptocorisa varicornis*) was the most important pest during 1915–16. The rice swarming caterpillar (*Spodoptera mauritia*) appeared in some parts of Kuttanad, and the rice stem borer (*Schœnobius bipunctifer*) is a common rice pest all over the State.

Insects and diseases of orchards and garden and their control, G. S. Ralston and R. E. Marshall (*Va. Polytech. Inst. Ext. Bul. 14 (1917), pp. 55*).—A popular summary of information.

Common garden insects and their control, A. Gibson (*Canada Dept. Agr., Ent. Branch Circ. 9 (1917), pp. 20, fig. 1*).—A popular summary of information.

Spraying for apple aphids and red bugs in New York, H. E. Hodgkiss (*Proc. Fruit Growers Assoc. Adams Co., Penn., 11 (1915), pp. 83–93*).—An address consisting of a summary of information on the control of these pests.

Defoliation, a defensive measure against vine pests, J. Capus (*Bul. Soc. Etude et Vulg. Zool. Agr., 15 (1916), No. 11–12, pp. 118–122; abs. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 3, p. 137*).—Experience has shown that defense against *Cochylis ambiguella* and *Eudemis botrana* is impossible without preliminary defoliation, and that this must be done at the time when the inflorescences are formed and before the leaves removed are full grown. A second defoliation is recommended if the fruit again becomes hidden by the development of the leaves; this gradual exposure prevents the grapes from being dried up by the sun.

Shade and forest insects in Manitoba, J. M. Swaine (*Agr. Gaz. Canada, 4 (1917), No. 9, pp. 755–763*).—Brief mention is here made of the western willow leaf beetle (*Galerucella decora*), the fall cankerworm, the spring cankerworm, the Negundo plant louse (*Chaitophorus negundinis*), the Negundo twig borer (*Proteopteryx willingana*), the spruce sawfly (*Lophyrus abietis*), the larch sawfly, etc.

Insects and prickly pear, W. W. Froggatt (*Agr. Gaz. N. S. Wales, 28 (1917), No. 6, pp. 417–426, figs. 4*).—In considering the relation of insects to the prickly pear, the author has made extracts from Tryon and Johnston's report, previously noted (E. S. R., 33, p. 134), and he comments on some of the suggestions of the

commissioners regarding insects that might be introduced from abroad into Australia to destroy the prickly pear.

Household pests and their treatment, H. GARMAN (*Kentucky Sta. Circ. 15 (1917), pp. 63-90, figs. 14*).—This is a popular summary of information.

The parasite methods of controlling insect pests, H. S. SMITH (*Cal. Citrogr., 2 (1917), No. 6, pp. 2, 3, figs. 4*).—This popular review of the subject includes an introduction by G. H. Hecke, State commissioner of horticulture of California.

The double purpose spray, A. A. RAMSAY (*Agr. Gaz. N. S. Wales, 28 (1917), No. 6, pp. 435-437*).—A report upon the results obtained from adding lead arsenate to other spray mixtures. The experiments indicate that soap should not be mixed with lead arsenate, but that lead arsenate may be mixed with both Bordeaux mixture and lime-sulphur mixture with safety.

Fumigation of ornamental greenhouse plants with hydrocyanic acid gas, E. R. SASSCER and A. D. BORDEN (*U. S. Dept. Agr., Farmers' Bul. 880 (1917), pp. 19, figs. 4*).—Substantially noted from another source (E. S. R., 36, p. 842).

Detection of hydrocyanic acid gas.—Use of small animals for this purpose, S. B. GRUBBS (*Pub. Health Rpts. [U. S.], 32 (1917), No. 16, pp. 565-570, fig. 1*).—The author's experiments, here summarized in tabular form, have led to the following conclusions:

"Sparrows or other small birds are the most delicate live indicators for hydrocyanic acid gas, but are not recommended for routine work. Mice or tame rats are almost as susceptible as sparrows and are probably the best test animals available. Cats are sufficiently susceptible, and with care the same animal may be used several times. Guinea pigs are quite resistant to the effects of the gas and should never be used where rats are available. If guinea pigs be the only test animals obtainable, exposure should be prolonged and other allowances made for these animals' increased resistance to the gas, as indicated in the included table."

Directions for raising rats and mice, by W. E. Castle and L. C. Dunn, are appended.

The Blattidæ of North America, north of the Mexican boundary, M. HEBARD (*Mem. Amer. Ent. Soc., No. 2 (1917), pp. 284+VI, pls. 10, figs. 2*).—The author recognizes 43 established species and one geographic race of cockroaches belonging to 26 genera, of which 9 species and 4 genera are described as new. In a supplement he lists 31 species found to be adventive but not established in portions of the United States and Canada.

Destruction of the migratory locust, P. CARIDE MASSINI (*An. Soc. Rural Argentina, 51 (1917), No. 4, pp. 309-314, pl. 1*).—This paper deals at length with the sarcophagid parasite *Sarcophaga caridei*, an important enemy of the locust in South America, noted by Dawe (E. S. R., 37, p. 357). A colored plate of the adult fly is included.

Fighting grasshoppers, including the results of a campaign conducted in 1916 and suggestions for the control of this pest, C. R. JONES (*Colo. Agr. Col. Ext. Serv. Bul., 1. ser., No. 118 (1917), pp. 12*).—Substantially noted from another source (E. S. R., 37, p. 661).

Is Diestrammena marmorata an injurious insect? M. WOLFF (*Centbl. Bakt. [etc.], 2. Abt., 45 (1916), No. 6-12, pp. 258-262; abs. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 3, p. 98*).—It is concluded that this orthopteran, introduced into Germany from Japan, does not feed on plants and that the injury ascribed to it is due to other less conspicuous insects.

Thrips attacking French bean flowers (*Agr. Gaz. N. S. Wales, 28 (1917), No. 6, p. 426*).—Through feeding upon the pollen, thrips injured French bean

flowers at Wamberal sufficient to prevent the formation of pods. Tobacco and soap applied as a spray appears to be a satisfactory remedy.

Work of combating the pear thrips in the Saanich Peninsula, A. E. Cameron and R. C. Treherne (*Agr. Jour.* [*Brit. Columbia*], *1* (*1917*), *No. 12, pp. 208, 212*).—The authors find that the attacks of pear thrips (*Tæniothrips inconsequens*), which is distributed throughout the peninsula and as far north as Duncan, can be absolutely controlled on apples, although unsatisfactory results have been obtained in the control of the pest on Italian pears and prunes.

As a first application for apples, pears, cherries, prunes, and plums and later applications on cherries, prunes, and plums, whale-oil soap, 5 lbs.; blackleaf 40, ¾ pint; and water, 85 gals. is recommended, the first application to be made at the time the thrips make their appearance on the buds, the second when the blossoms are showing pink or white, as the case may be, and the third just after the blossoms are shed. Owing to the prevalence of apple scab the authors recommend a combination spray of summer strength lime-sulphur and blackleaf 40 in the proportion of 1:900 for the second and third applications for apples and pears.

"One of the most unsatisfactory aspects of the thrips attack in the Saanich Peninsula is the repeated failure of the prune crop. The buds are very soon destroyed once the pest effects an entrance, and the damage done to Italian prunes and different varieties of plum is probably far heavier proportionately than that done to pears."

Contribution to the knowledge of the galls of Java.—II. The thysanopterous cecidia of Java and their inhabitants, H. Karny and W. and J. van Leeuwen-Reijnvaan (*Ztschr. Wiss. Insektenbiol.*, *10* (*1914*), *Nos. 6–7, pp. 201–208; 8–9, pp. 288–296; 10–12, pp. 355–369; 11* (*1915*), *Nos. 1–2, pp. 32–39; 3–4, pp. 85–90; 5–6, pp. 138–147; 7–8, pp. 203–210; 9–10, pp. 249–256; 11–12, pp. 324–331*).—This second contribution to the thysanopterous cecidia and their inhabitants in Java is in continuation of that previously noted (E. S. R., 30, p. 250).

Helopeltis in tea gardens, S. Leefmans (*Dept. Landb., Nijv. en Handel* [*Dutch East Indies*], *Meded. Proefstat. Thee, No. 46* (*1916*), *pp. 21; abs. in Rev. Appl. Ent., Ser. A, 5* (*1917*), *No. 3, pp. 131, 132*).—This interim report deals with investigations of species of Helopeltis in Java extending over a period of two years.

Contribution to the Helopeltis problem in tea culture, S. Leefmans (*Dept. Landb., Nijv. en Handel* [*Dutch East Indies*], *Meded. Lab. Plantenziekten, No. 26* (*1916*), *pp. VI+214, pls. 13*).—This is an extended report of investigations conducted in Java. The classification and biology of the several Javanese species of Helopeltis, namely, *H. antonii*, *H. theivora*, *H. cuneatus*, and *H. cinchonæ*, are first dealt with, followed by a discussion of natural enemies, control measures, etc.

H. antonii is the principal enemy of tea in Java. *H. theivora*, the most dangerous enemy of tea in British India, does not cause much injury in Java, and in West Java has only been found in the lowlands. *H. cuneatus*, a species new for the fauna of Java, does not attack tea and has been found only on plants of the family Araceæ. *H. cinchonæ*, a second species new for the fauna, has lately been found to attack tea and possibly will grow more dangerous in the future.

A map is given which shows their distribution in West Java. A summary of the investigation is given in English and a bibliography of 27 titles is included.

Citrus white fly (Aleyrodes citri) on lemons and oranges in the Province of Mendoza, Argentina, R. Sanzin (*Enol. Argentina, 1 (1915), No. 2, pp. 42, 43, figs. 6; abs. in Rev. Appl. Ent., Ser. A, 3 (1915), No. 11, pp. 694, 695*).—The citrus white fly has spread so rapidly in the Province of Mendoza that it is now one of the worst pests of oranges and lemons; not a single tree seems to be free from its attacks, which cause withering of the leaves.

Life history of Macrosiphum illinoisensis, the grapevine aphis, A. C. Baker (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 3, pp. 83–91, pls. 2*).—In the present paper the author reports upon more recent studies than those previously noted (E. S. R., 33, p. 857; 37, p. 358), in the first of which the alternation in food plants was recorded, and gives an account of all the forms of the species. This aphid, originally described by Shimer, from Illinois, in 1866 under the name *Aphis illinoisensis*, and later by Thomas as *Siphonophora viticola*, is now known to occur in the District of Columbia, Georgia, Indiana, Maryland, Missouri, Mississippi, North Carolina, New Jersey, New York, Oklahoma, Pennsylvania, Texas, and Virginia, and what appears to be the same species was taken on grape at Campinas, Brazil, in September, 1898. It occurs abundantly on wild grape (*Vitis* spp.) in the southern United States and often is quite destructive to cultivated varieties.

The eggs, which are laid upon the twigs of *Viburnum prunifolium*, usually being placed most thickly close around the buds, sometimes hatch during quite cold weather in the third week in March and continue hatching until the early part of April. The stem mothers on hatching out seek the buds and begin feeding, and, when the flowers begin to open, may crowd down into the flower clusters. They feed upon the stems of the individual blossoms, upon the twigs, and somewhat upon the leaves.

The spring migrants begin to appear in the second generation, although their number is not abundant until the third generation and their production then gradually decreases for several generations. The spring migrants fly to wild grapes and to grapes in the vineyards, the migration being at its height during the first week in May.

The summer wingless forms occur very abundantly throughout the summer. They reproduce very quickly during the early summer and seven generations have often reached maturity by July 1. Intermediates between the summer winged and summer wingless forms have been found upon grape. Winged forms are produced in every generation from the second onward, but fewer winged line generations occur than wingless line generations.

The fall migrants are produced upon the grapes during the early part of October and are found upon the viburnum depositing young oviparous females during the second week in that month. "The males are produced a little later than the fall migrants, but can be found flying at the same time and may be taken on the viburnums in company with the fall migrants. . . . The oviparous female is a small, dark reddish aphis produced during the early part of October on the viburnum. It feeds upon the twigs and may be found until frost kills all the insects. Each oviparous female lays three to six eggs close about the buds or occasionally scattered along the twigs."

Aphididæ of California, [XII], E. O. Essig (*Univ. Cal. Pubs. Ent., 1 (1917), No. 7, pp. 301–346, figs. 30*).—This paper consists of descriptions of five new species of plant lice from California and notes on other Aphididæ, chiefly from the campus of the University of California, Berkeley, Cal. See also a previous note (E. S. R., 35, p. 56).

Butterflies worth knowing, C. M. Weed (*Garden City, N. Y.: Doubleday, Page & Co., 1917, pp. XIII+286, pls. 48*).—A popular account.

On a case of facultative parthenogenesis in the gipsy moth (Lymantria dispar), with a discussion of the relation of parthenogenesis to sex, R. GOLDSCHMIDT (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 32 (1917), No. 1, pp. 35–43*).—This paper includes a list of 22 references to the literature on the subject.

The bollworm or corn earworm, F. C. BISHOPP (*U. S. Dept. Agr., Farmers' Bul. 872 (1917), pp. 15, figs. 7*).—This popular account replaces Farmers' Bulletin 290, previously noted (E. S. R., 19, p. 53).

Controlling the peach borer, S. W. FUNK (*Pract. Farmer, 113 (1917), No. 18, p. 316*).—In Pennsylvania the author has practiced banking peach trees with from 6 to 8 in. of earth during the entire year, and in this way prevented the borers from getting into the roots where they are hard to reach. The mounds are removed by the use of a hoe during September, the gum removed, and the borers cut out by means of a sharp knife. The importance of making the cut as nearly perpendicular as possible in order to prevent mutilating the bark is pointed out.

The currant borer, Sesia (Ægeria) tipuliformis, H. M. NICHOLLS (*Agr. and Stock Dept. Tasmania, Bul. 69 (1917), pp. 8, figs. 5*).—The common currant borer (*S. Ægeria tipuliformis*) is said to be rather widely spread in the northern part of Tasmania.

The cassava hawk moth (Dilophonota ello), A. DA SILVEIRA (*Bol. Agr. [Sao Paulo], 17 ser., No. 9 (1916), pp. 710–724*).—A summary of information on this pest in Brazil, including descriptions of its several stages. Accounts of this insect in British Guiana by Bodkin (E. S. R., 28, p. 354) and in Cuba by Cardin (E. S. R., 28, p. 854) have been previously noted.

On the life history of the apple fruit miner, Argyresthia conjugella, H. OKAMOTO (*Trans. Sapporo Nat. Hist. Soc., 6 (1917), No. 3, pp. 213–219*).—This is a report of observations made at the Hokkaido Experiment Station at Sapporo, Japan.

It appears that the eggs of *A. conjugella* are for the most part laid upon the fruit, though a very few are deposited upon the leaves. Two moths observed deposited 25 and 29 eggs, respectively, the preoviposition period varying from two to four days and the incubation period in the orchard from seven to eight days. The larvæ which hatch out upon the apples soon seek a place to enter, from 70 to 80 per cent of the larvæ entering the apple on the sides and from 20 to 30 per cent on the stem or calyx, gummy exudations commonly occurring at the place of entrance. The tunnels are numerous and extend in all directions. The larvæ that hatch out upon the leaves commence to feed there.

The average time spent in the fruit was 50 days for 10 larvæ observed. When about full grown the larva makes a passageway out of the fruit, usually toward the side of the apple, then enters the soil and forms its cocoon. The larvæ which develop late in the season sometimes spin their cocoons on the inside of boxes or barrels. Pupation takes place early in the following spring.

The adults spend most of their time resting in the foliage of the apple and are rarely seen in the orchard. When disturbed they fly away so quickly that the eye is unable to follow them. The moths do not appear to be attracted by lights at night.

Viviparity in the Diptera and the larvæ of viviparous Diptera, D. KEILIN (*Arch. Zool. Expt. et Gén., 55 (1916), No. 9, pp. 393–415, figs. 8; abs. in Jour. Roy. Micros. Soc., No. 2 (1917), pp. 213, 214*).—The Diptera which are always viviparous are divided by the author into two groups: (1) Those in which the larvae are not nourished in the uterus of the mother, where only the embryonic development proceeds, namely, some Tachinariæ, Dexiidae, all the Sarcophagidæ, various Anthomyidæ (*Musca larvipara* and *Mesembrina meridiana*); and (2) those in which the larvæ pass all their time in the maternal uterus, some

being born as larvæ (Glossina) and others as pupæ (Hippobosca, Melophagus, and Ornithomyia).

The relation of mosquitoes and flies to the epidemiology of acute poliomyelitis, H. Noguchi and R. Kudo (*Jour. Expt. Med., 26 (1917), No. 1, pp. 49–57*).—"*Culex pipiens* raised from the larval stage in water experimentally contaminated with an abundance of poliomyelitic virus were found to be incapable of causing the infection when allowed in large numbers to bite normal Macacus monkeys. *C. pipiens*, which were fed on infected poliomyelitic monkeys during different stages of the disease, were found to be incapable of transmitting the infection when allowed in large numbers to bite normal Macacus monkeys. A previous disturbance of the meninges by an injection of horse serum into the intrathecal space did not alter the result, which was negative.

"The offspring of the mosquitoes, which were either reared in the infected tanks or fed on infected monkeys, were found to be entirely harmless when allowed to feed in large numbers on a normal monkey. There was no hereditary transmission of the virus from one generation to another. No trace of the virus of poliomyelitis was demonstrable in the filtrate of an emulsion of adult flies and pupæ of the common house fly and bluebottle fly, which were reared in the laboratory on slices, emulsion, or filtrate of monkey brain containing the poliomyelitic virus. The intracerebral injection of the filtrate produced no poliomyelitic infection in the normal monkey."

Notes on fly control in military camps, H. B. Kirk (*Wellington, New Zeal.: New Zealand Defence Dept., 1916, pp. 16, figs. 3*).—A summary of practical information on this subject.

Some winter observations of muscid flies, M. Kisliuk, jr. (*Ohio Jour. Sci., 17 (1917), No. 8, pp. 285–294*).—This paper is based upon experiments conducted at College Park, Md., during 1914–15, and continued at Columbus, Ohio, during 1916–17. They show the greatest length of life of adults under winter conditions to be 44 days (December 12, 1914, to January 29, 1915, extreme temperatures 15 to 63°, mean 45°) in the unheated stable, and but 30 days (December 16, 1914, to February 2, 1915, extreme temperature 13 to 62°, mean 30°) in the insectary. Eggs were not deposited in the insectary until April 20, while in the stable they were noted on May 6.

Under natural conditions neither eggs nor maggots were found alive in the normally preferred situations, although the maggots will probably be found in early winter. The adults were not collected during the winter proper in houses where it was formerly supposed they were hiding. Apparently under natural conditions the house fly hibernates as pupa.

The author's observations indicate that many of the other common flies hibernate in the larval and pupal stages, including *Lucilia sericata*, *Phormia regina*, *Calliphora erythrocephala*, *C. vomitoria*, and *Cynomyia cadaverina*. *L. cæsar* may spend the winter in the larval stage, and there is plenty of evidence that *Pollenia rudis* hibernates as an adult, although the apparent appearance of fresh spring specimens suggests that it also hibernates in the immature stages.

Florida and the Mediterranean fruit fly, E. A. Back (*Quart. Bul. Plant Bd. Fla., 1 (1917), No. 4, pp. 159–171, pls. 2, figs. 5*).—In this general account the author calls attention to the disastrous results that would follow should this fly gain entrance to Florida.

The apple maggot in Nova Scotia, W. H. Brittain and C. A. Good (*Nova Scotia Dept. Agr. Bul. 9 (1917), pp. 70, pls. 7, figs. 3*).—This bulletin is based upon a careful inspection of maggot-infested territory of Nova Scotia, and upon experimental work by the junior author during the seasons of 1914 and

1915, an account of which has been noted (E. S. R., 35, p. 853). Since that time additional investigations have been carried on by the senior author.

"The emergence of the flies in summer varies greatly with season and locality; they may appear early in July and are usually present in numbers by the third week, the maximum emergence occurring in the early part of August. They continue to emerge, however, thoughout the month of August and well into September. Several days after emerging the eggs are laid by the female beneath the skin of the fruit, one in a place. The flies feed on the waxy substance on the surface of the fruit, first moistening any solid particles with saliva ejected from the mouth.

"The eggs hatch in from 5 to 12 days and the larvæ feed for a varying length of time within the fruit, burrowing through it in all directions until it is honeycombed by their tunnels. The pupal stage is passed in the soil, and the winter is spent in this state. A proportion of the flies remain over another winter as pupæ."

Experiments indicate that a method cheaper and easier than destroying the fallen fruit may be found in the use of arsenical sprays. "The use of arsenate of lead 2 lbs. to 40 gal. of water, applied once when the first flies were observed, which in the average season will be about July 15, and again two weeks later, gave excellent results even in a very wet season. It will usually be sufficient to defer the last summer spray until about the end of the first or second week in July, repeating the application near the end of the month. When it is necessary to apply a fifth summer spray for apple scab, the addition of arsenate of lead will enable it to serve as the first maggot spray. It is particularly important to have the trees well covered with the poison through the early part of August, for this is the time when the greatest number of eggs are laid. The addition of molasses to this spray does not appear to make the poison more attractive to the flies as was formerly supposed, and the experiments undertaken show little if any benefit from its use. From a practical standpoint it is not safe to defer the first spray until flies are actually seen in the orchard, as considerable damage may be done before this time."

Danish Diptera, W. LUNDBECK (*Diptera Danica. Copenhagen: G. E. C. Gad, pt. 3 (1910), pp. 329, figs. 141; pt. 4 (1912), pp. 416, figs. 130; pt. 5 (1916), pp. 603, figs. 202*).—These volumes, in continuation of those previously noted (E. S. R., 21, p. 154), deal with the Empididæ, Dolichopodidæ, and Lonchopteridæ and Syrphidæ, respectively.

A monographic study of the parasitic Diptera of Africa, II, J. RODHAIN and J. BEQUAERT (*Bul. Sci. France et Belg., 50 (1916), No. 1–2, pp. 53–165, pls. 2, figs. 30; abs. in Rev. Appl. Ent., Ser. B, 5 (1917), No. 4, pp. 49, 50*).—The second part of the paper previously noted (E. S. R., 36, p. 359) consists of a revision of the Œstrinæ on the African Continent.

The rough-headed cornstalk beetle in the Southern States and its control, W. J. PHILLIPS and H. FOX (*U. S. Dept. Agr., Farmers' Bul. 875 (1917), pp. 10, figs. 8*).—This account relates to (*Ligyrus*) *Euetheola rugiceps*, a robust, black scarabeid beetle which has been increasing in importance in recent years and has caused serious damage to corn crops in the Southern States, a noteworthy outbreak having occurred in the tidewater section of Virginia during the early summer of 1914. It appears to be confined entirely to the Southern States, there being no record of its occurrence north of Virginia, Kentucky, and Kansas.

The injury to corn is caused entirely by the adult beetle and occurs only during the spring and early summer. In Virginia it was confined to low, poorly drained lands in the eastern section of the State. The beetles begin

to attack the crop as soon as the plants appear above ground and continue their attack until the plants are knee-high or even somewhat taller. They bore into the outer wall of the stalk immediately below the surface of the ground, making a large, ragged opening, and destroy the tender growing point or "heart," upon which this beetle appears to feed especially. This results in the withering of the central roil of leaves, the other leaves retaining their freshness for a considerable longer period.

The eggs are laid during the early summer, chiefly during June, and are deposited singly or in groups of three or four in the ground wherever the beetles happen to be feeding. They hatch in about two weeks and reach full growth in about two months, two weeks being passed in the pupal stage. The adults appear about the middle of September and soon go into hibernation, there being but one generation a year. Observations of its habits show that one of the most promising methods for controlling the beetles is to avoid maintaining pastures for indefinite periods or allowing any part of the farm to grow up as waste land. The control measures are here summarized by the author as follows:

"Eliminate all old pastures or waste land, especially low, moist areas, and drain such lands thoroughly. Pasture hogs in waste or pasture lands that can not be conveniently drained and cropped. Plant corn early, say about April 20 for tidewater Virginia and earlier for more southerly localities. Give liberal applications of barnyard manure or commercial fertilizers whenever practical. Employ children or cheap labor to collect and destroy the beetles when a field first shows injury. Do not allow corn to follow sod if possible to avoid it. Plow sod land in late summer and early fall in order to destroy the pupæ of the rough-headed cornstalk beetle."

A list of the Japanese and Formosan Cicadidæ, with description of new species and genera, S. MATSUMURA (*Trans. Sapporo Nat. Hist. Soc., 6 (1917), No. 3, pp. 186–212*).—The author finds that in Japan and Formosa there are 59 species representing 28 genera, of which 14 species and 6 genera are new.

Honeybees in relation to horticulture, B. N. GATES (*Trans. Mass. Hort. Soc., 1917, pt. 1, pp. 71–88*).—This lecture, delivered before the Massachusetts Horticultural Society on February 24, 1917, deals with pollination, the need of honeybees in the setting of crops, bees for the horticulturist, fruits and vegetables pollinated by bees, securing and maintaining bees, alleged injury to fruit by honeybees, injury to cultivated flowers, and spraying *v.* beekeeping (E. S. R., 35, p. 662).

Thirty-seventh annual report of the Beekeepers' Association of the Province of Ontario, 1916 (*Ann. Rpt. Bee-Keepers' Assoc. Ontario, 1916, pp. 62, figs. 5*).—The proceedings of the association are reported.

Notes on the Egyptian honeybee, L. GOUGH (*Bul. Soc. Ent. Egypte, 9 (1916), No. 1, pp. 25–32*).—These notes relate to the bionomics of *Apis fasciata*.

Foul brood of bees; its recognition and treatment, H. GARMAN (*Kentucky Sta. Circ. 17 (1917), pp. 99–106, figs. 3*).—This is a popular summary of information.

Life history of the larval forms of Adelura gahani n. sp., a braconid parasite of phytomyzid larvæ, G. DE LA BAUME-PLUVINEL (*Arch. Zool. Expt. et Gén., 55 (1916), No. 3, pp. 47–59, pl. 1, figs. 3; abs. in Jour. Roy. Micros. Soc., No. 2 (1917), pp. 216, 217*).—An account is given of the life history of the internal parasite of a phytomyzid larva which mines in the leaves of Ancolias (Aquilegia), described as new under the name *Adelura gahani*.

Description of a new hymenopteran (Anteris nepæ) parasitic on the eggs of Nepa, C. FERRIÈRE (*Arch. Zool. Expt. et Gén., Notes et Rev., 55 (1916), No. 4,*

pp. 75–80, figs. 4; abs. in Jour. Roy. Micros. Soc., No. 2 (1917), p. 216).—Under the name *Anteris nepæ* a parasite which develops in the eggs of Nepa is described as new.

FOODS—HUMAN NUTRITION.

The nutritive value of margarins and butter substitutes with reference to their content of the fat-soluble accessory growth substance, W. D. Halliburton and J. C. Drummond (*Jour. Physiol., 51 (1917), No. 4–5, pp. 235–251, figs. 17*).—From experiments on rats the authors draw the following conclusions:

"The fat-soluble accessory growth substance is present in beef-fat and 'oleo-oil' and is present in margarins prepared upon such a basis. Such margarins are nutritively the equivalent of butter.

"Coconut oil, cottonseed oil, arachis oil, and hydrogenated vegetable oils contain little or none of this accessory substance, hence margarins prepared with a basis of these fats have not an equal nutritive value to that of butter. Nut butters prepared from crushed nuts and vegetable fats are similarly not equal to butter.

"Lard substitutes prepared from vegetable oils are equal to lard in their nutritive value, both alike being destitute of the fat-soluble accessory substance."

Edible fats, in war and law, D. Wesson (*Jour. Indus. and Engin. Chem., 10 (1918), No. 1, pp. 71–73*).—A statement of the fat situation in this country, with comment on the oleomargarin and filled cheese laws.

Butter as a vehicle of infection in typhoid, M. F. Boyd (*Jour. Amer. Med. Assoc., 69 (1917), No. 24, pp. 2030–2032*).—A report of two outbreaks of typhoid, in one of which the epidemiological evidence implicating butter was considered conclusive, in the other merely suggestive. In neither case was the cream pasteurized. The author comments that attenuation and diminution of the numbers of typhoid bacilli in the presence of lactic acid and the salt in the butter prevents it from being as great a menace as infected milk.

The distribution of milk (*Roy. Soc. [London], Food (War) Com., 1917, Nov. 20, pp. 3*).—The committee recommends that due to the probability of a milk shortage, a priority scheme for milk distribution be adopted. Persons needing milk are divided into six groups, as follows: Infants from birth to 9 months, 1½ pts. per day; 10 to 18 months, 1½ pts. per day; 19 months to 5 years, 1 pt. per day; 6 to 14 years, 1 pt. per day; all other healthy persons, ¼ pt., or according to the supply available; and sick persons and pregnant women, according to medical certificate. In case of shortage they would receive preference in the order listed, group 6 ranking with (1) and (2).

A study of Puget Sound oysters, Edith F. Hindman and F. J. Goodrich (*Amer. Food Jour., 12 (1917), No. 11, pp. 611–614*).—The article includes results of bateriological analyses of oysters and their liquor under different conditions of handling.

The manufacture of meat food products, R. D. MacManus (*Amer. Food Jour., 12 (1917), No. 10, pp. 559–563, figs. 6*).—This gives a description of the methods of handling the animals and the manufacture of by-products.

The sterilization of unsound meat, W. J. Howarth (*Jour. State Med., 25 (1917), No. 6, pp. 161–168*).—The author concludes that in England it would be very unwise to undertake the sterilization of unsound, condemned meat with the object of subsequently selling the meat to the public.

Memorandum on the uses of maize or Indian corn, W. H. Thompson (*Roy. Soc. [London], Food (War) Com. Memo., 1917, Apr. 20, pp. 5*).—Data are included on the composition, varieties, products, and digestibility of maize.

Manufacture of corn starch, corn sirup, and corn sugar, A. P. BRYANT (*Amer. Food Jour., 12* (*1917*), *No. 9, pp. 511–515, figs. 7*).—The methods of manufacture are described.

Cottonseed products, K. H. VAKIL (*Jour. Soc. Chem. Indus., 36* (*1917*), *No. 13, pp. 685–692, figs. 10*).—This article describes methods of treating the seed, variations in varieties from different countries, and the composition and use of the products.

The composition and relative economy of some bread sold in Washington, D. C., M. A. POZEN and M. STARBECKER (*Amer. Jour. Pub. Health, 7* (*1917*), *No. 6, pp. 570–572*).—It is stated that the purchasing power of the penny in Washington has shrunk 21.5 per cent in the case of six-cent loaves and 13.1 per cent in the case of five-cent loaves since November, 1916. On the basis of protein and total solids content, the four-cent loaf was found the most economical, followed by the ten, five, twelve, and six-cent loaf in the order named.

Preservation of vegetables by fermentation and salting, L. A. ROUND and H. L. LANG (*U. S. Dept. Agr., Farmers' Bul. 881* (*1917*), *pp. 15, fig. 1*).—The object of this publication is to describe and explain methods of preservation by fermenting and salting, to indicate the purpose for which they are specially applicable, and to tell how the preserved products can best be prepared for table use.

Preservation by fermentation may take place by packing with layers of dry salt (3 lbs. to 100 lbs. of vegetables) and keeping in a warm place under pressure until fermentation occurs. When fermentation stops, the container is set away in a cool place and covered with paraffin or otherwise made air-tight. Cabbage, string beans, and greens may be preserved in this way. For less watery vegetables a brine is used containing, in each gallon of water, ½ pt. of vinegar and ¾ cup of salt. In both cases it is the formation of lactic acid from the sugars extracted from the vegetables that acts as the preservative.

To salt vegetables, 25 lbs. of salt are used to 100 lbs. of vegetables, in which proportion yeasts and molds are prevented from growing. The salt and vegetables are packed in alternate layers and are under pressure for 24 hours. If they are not then covered with brine, enough brine (1 lb. salt in 2 qts. water) is added to cover.

Methods for preparing for the table vegetables preserved in this way are included.

Imitation or pseudo coffees.—Many substitutes to which the war has called attention (*Sci. Amer. Sup., 84* (*1917*), *No. 2187, pp. 340, 341, figs. 9*).—A description of the plants used in place of coffee is given.

[Food conservation and other patriotic topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 4* (*1917*), *No. 16, pp. 395–410*).—This number, called a Patriotic Number, makes an appeal for food conservation, thrift, and similar topics.

Food production, conservation, and distribution (*U. S. House Representatives, 65. Cong., 1. Sess., Hearings Com. Agr., 1917, pp. 538*).—Hearings on various measures relative to the production and conservation of food supplies are given.

The national food policy.—The danger of restricting the consumption of meat (*Roy. Soc.* [*London*], *Food* (*War*) *Com., 1917, Mar. 30, pp. 1–3*).—The report of this committee shows that in the United Kingdom cereals normally constitute 34 per cent of the food energy, of which 30 per cent is from wheat; meat, including poultry and game, furnishes 18 per cent; dairy products 15 per cent; sugar 13 per cent; potatoes 8 per cent; and other items (fruit, fish, etc.) 12 per cent. It is advised that a full supply of cereals be maintained; that maize, barley, rice, and other grain be reserved for human consumption;

that individual consumption be reduced to the minimum required for efficiency, but that no special restriction be placed on meat consumption; that the number of cattle, sheep, and pigs be reduced; and that the importation of cereals be increased and the importation of meats decreased.

Investigation of workers' food and suggestions as to dietary, L. E. HILL (*Min. Munitions [Gt. Brit.], Health Munition Workers Com. Memo. 11 (1916), pp. 11*).—Studies showed that meals served at canteens to munition workers have an energy value of about 1,000 calories and are well balanced as to protein, fat, and carbohydrate. The cost compares very favorably with similar meals at cafés. Comparisons are also made with meals brought from home. In hotels erected for munitions workers, the deitary was found to average 3,695 calories per man per day.

Suggested daily dietaries with analyses and costs are appended.

The family budgets and dietaries of 40 labouring class families in Glasgow in war time, MARGARET FERGUSON (*Proc. Roy. Soc. Edinb., 37 [1916–17], No. 2, pp. 117–136*).—Forty representative families were studied whose average income was 30s. ½ d. The caloric value of the diet averaged 3,297 calories per man per day, and the protein 102 gm. per man per day. Forty-eight per cent of the energy value was obtained from cereals, and 40 per cent from bread. The average cost in 1915–16 had increased 36.4 per cent above that in 1911. In November and December, 1915, the average value obtained for 1d. was 380 calories and in the spring of 1916 it was 305 calories.

The food requirement in infancy (*Jour. Amer. Med. Assoc., 69 (1917), No. 14, p. 1175*).—This review of recent work shows that in new-born infants at complete rest, the metabolism does not exceed 48 calories per kilogram of body weight per day. Between two months and one year it increases to 60 calories. Between two and six months the muscular activity may increase the metabolism 67 to 70 per cent over the basal metabolism at rest. It is suggested that if the infant is very quiet, 15 per cent should be added, if normally active 25 per cent, and if extremely active about 40 per cent. There should also be added 15 per cent for energy lost in the excreta and 20 per cent for growth. If the food contains a large proportion of protein (cow's milk) it will have to have greater fuel value than if human milk is fed because of the stimulating effect of the protein.

These requirements refer to normal infants.

The metabolism of arginin, W. H. THOMPSON (*Jour. Physiol., 51 (1917), No. 3, pp. 111–153*).—Arginin carbonate given with food to dogs cause an increase of total creatinin in the urine of 10 per cent on a meat-free diet. With birds the increase was 22.6 per cent. When given hypodermically or by intravenous injection to dogs on a meat-free diet, the increase in creatinin in the urine was 22.5 per cent over the normal. In rabbits the creatinin excretion was 80 per cent above normal. The addition of arginin to the food of birds and dogs had no effect on the excretion of preformed creatinin. When arginin was given in the food for two or more periods with intervals between a decreased output of creatinin was found.

Observations on the excretion of arginin show that the partition of its nitrogen in the urine of dogs was on the average as follows: (a) Arginin carbonate given with food—total nitrogen 56.5 per cent, urea nitrogen 34.7 per cent, ammonia 13.7 per cent, amino-acid nitrogen 2.33 per cent, nitrogen as total creatinin 3.47 per cent; (b) arginin carbonate subcutaneously injected—total nitrogen 67.87 per cent, urea nitrogen 35.4 per cent, ammonia 4.05 per cent, amino-acid nitrogen 4.7 per cent, and nitrogen as total creatinin 4.12 per cent.

The vitamin hypothesis in relation to alleged deficiency diseases (*Jour. Amer. Med. Assoc., 69 (1917), No. 24, pp. 2040, 2041*).—A survey of recent works

on so-called deficiency diseases, which seems to show that beri-beri and xerophthalmia are due to the absence of a specific unidentified factor, but that pellagra and scurvy are not due to such a factor. There is doubt whether scurvy is a distinct entity, and the theory of infection in pellagra is still a possibility.

ANIMAL PRODUCTION.

The nutrition of farm animals, H. P. Armsby (*New York: The Macmillan Co., 1917, pp. XVIII+743, figs. 45*).—This work does not claim to be another edition of facts in feeding, but treats as far as possible with our present scope of knowledge of the fundamental laws governing the nutrition of farm animals. The animal body is treated as a transformer of energy partly into motion and incidentally into a reserve material which can be utilized as human food. It is the latter phase which this volume presents.

The work is divided into four parts. The first deals with materials of nutrition, the food compounds of plants and animals and the composition of cells, tissues, and organs. Part 2 deals with the physiology of nutrition or the methods of transference and building in the animal organism. Part 3 treats of the needs of animals and the amounts of matter and energy necessary in producing the materials or work for which they are kept. The fourth part considers the feed supply, values, and rationing. An appendix exhibits tables of the maintenance, fattening, milk and work production requirements of different animals, and the food values of various feeding stuffs.

The work deals with the natural laws governing the nutrition of farm animals rather than with the broader field of animal husbandry. It is, therefore, intended for the student with some knowledge of chemistry and physics and not for the general farmer.

The direct and indirect effects of X-rays on the thymus gland and reproductive organs of white rats, Evelyn E. Hewer (*Jour. Physiol., 50 (1916), No. 7, pp. 438–458, fig. 1*).—A study was made of the direct effects of X-rays on the thymus and male and female gonads of white rats, and of the indirect effects of the rays on nonirradiated organs.

Irradiation of the thymus only causes slight degeneration of the male gonads and delay of sexual maturity, but no alteration in the female. Irradiation of the whole animal when very young with a very small dose hastens sexual development in the male. Irradiation causes a degeneration of the testes. The more immature the testes and sperm cells the more easily they are affected by X-rays. Irradiation of the male and female gonads has a marked indirect effect on other organs, especially on the thymus. Primordial and young ova are more resistant to the action of X-rays than older follicles. The corpora lutea become abnormally vascular, but appear otherwise unchanged. Hypertrophy of the interstitial gland is constant, and persists even after apparent regeneration of the ovary.

A list of 19 references is included.

The numerical results of diverse systems of breeding, with respect to two pairs of characters, linked or independent, with special relation to the effects of linkage, H. S. Jennings (*Genetics, 2 (1917), No. 2, pp. 97–154*).—In this continuation of the study of methods of measuring results of systems of breeding (E. S. R., 34, p. 764), the author gives formulas for finding in later generations the results of continued breeding by a given system when two pairs of characters, linked or independent, are considered. The systems of breeding considered are (1) random mating, (2) selection with respect to a given single character, (3) assortative mating with respect to a single character, and (4) self-fertilization. In each system two cases are dealt with, that in

which linkage is the same in both sets of gametes, and that in which linkage is complete in one set.

In each system general formulas are derived for transforming generation n into generation $n+1$. In several systems special formulas are given for finding directly in any later generation n the proportions of the population, when one begins with parents that are a cross between *ABAB* and *abab*, or between *AbAb* and *aBaB*. With regard to selection and assortative mating with respect to a single character, formulas are given for the effect on the single pairs taken separately; thus, for the effect of selection or assortative mating with respect to one character on the distribution of another character linked with that one. The formulas are collected for convenience in 31 tables in the appendix.

Some breeding properties of the generalized Mendelian population, E. N. WENTWORTH and B. L. REMICK (*Genetics, 1 (1916), No. 6, pp. 608–616*).—Some properties of mating a generalized Mendelian population $r\ AA+s\ Aa+t\ aa$ are considered in this paper, random mating (two types of assortative mating and mating of dominants alone) being considered. Formulas are presented which will give the expected proportions of *AA*, *Aa*, and *aa* in any generation resulting from the practice of such matings.

Studies on inbreeding.—VIII, A single numerical measure of the total amount of inbreeding, R. PEARL (*Amer. Nat., 51 (1917), No. 610, pp. 636–639, fig. 1*).—The author describes a single numerical constant which has been devised to supplement or replace the inbreeding curve (E. S. R., 38, p. 65) as a designation of the total inbreeding exhibited in a particular individual. By the method it is seen that American Jersey cattle, as judged by random samples of the general population, are about 28 to 30 per cent as closely inbred as the maximum possible amount, taking account of the first eight ancestral generations as a whole.

Tricolor inheritance.—II, The Basset hound, H. L. IBSEN (*Genetics, 1 (1916), No. 4, pp. 367–376, figs. 2*).—This part of this series (E. S. R., 35, p. 770) discusses the probable genetic factors involved in the production of the coat color in Basset hounds, the relation of these factors to each other, and test matings which could be made to determine how closely the factors and relationships proposed fit the actual cases.

Basset hounds are of two kinds, (1) tricolors, and (2) tan-and-whites. Black-and-whites do not occur in the breed. Tricolors are described as "black, white, and tan, the head, shoulders, and quarters a rich tan, and black patches on the back." Tan-and-whites have tan heads and "tan is often found on the back."

The factors involved in color inheritance in Basset hounds are (1) *B*, the factor for black, always present in Bassets; (2) *E*, the extension factor which extends the black (or chocolate) and may be present or absent; (3) *T*, the factor for uniform pigmentation (animals without *T* are either black-and-tan, liver-and-tan, or red (tan) and lemon; *T* is always absent in Bassets); and (4) *R*, the factor which inhibits the formation of black (or chocolate) pigment in the coat (it is questionable whether this factor is ever present in Bassets). Tricolors may be of the formula *BBEEttrr* or *BBEettrr*. *Ee* tricolors mated together get some *ee* offspring which are tan-and-whites and which should breed true. These may have tan spots on the back. In this case, when *T* is absent, the tan on the head should be of a lighter shade than the tan on the back. If *R* is present in Bassets then *BBEE* (or *Ee*) *ttRr* tan-and-whites (with tan on the back) bred together should get some tricolor offspring. This can not be determined from available data.

Tricolor inheritance.—III, Tortoise-shell cats, H. L. IBSEN (*Genetics, 1 (1916), No. 4, pp. 377–386*).—The author reviews the work of others and offers

an explanation of the inheritance of tortoise-shell coat color or black-and-orange spotting in cats. This is followed by a general comparison of tricolor in guinea pigs, Basset hounds, and cats.

[Miscellaneous experiments in animal husbandry] (*Pennsylvania Sta. Bul. 147 (1917), pp. 3–14, figs. 6*).—A number of short articles are included.

Swine fattening experiment.—This was made to test the value of nitrogenous supplements to corn and different methods of preparing corn in pig feeding. Thirty-five pigs, weighing about 110 lbs. each, were divided into five lots of seven pigs each and fed from November 10, 1916, to February 2, 1917. Lot 1 on shelled corn and tankage (10:1) made an average daily gain per head of 0.93 lb., at a cost of 8.45 cts. per pound of gain; lot 2 on corn meal and tankage (10:1) gained 1.19 lbs., at a cost of 8.66 cts. per pound; lot 3 on corn meal and linseed meal (7:1) gained 0.51 lbs., at a cost of 15.1 cts. per pound; lot 4 on corn meal and chopped alfalfa hay (4:1) gained 0.31 lb., at a cost of 20.17 cts. per pound; and lot 5 on ear corn ad libitum and 4 lbs. of tankage per 1,000 lbs. of live weight daily gained 0.99 lb., at a cost of 7.83 cts. per pound.

Brood sows.—Four lots of four brood sows each were maintained during the gestation period (114 days) on the following rations: Lot 1 on alfalfa hay at an average cost of $5.69 each; lot 2 on alfalfa hay ad libitum and 1 lb. of shelled corn daily per 100 lbs. live weight at a cost of $10.46; lot 3 on a mixture of shelled corn and tankage (10:1) fed at the rate of 2 lbs. per 100 lbs. live weight at a cost of $7.22; and lot 4 equal parts of corn meal, ground oats, and wheat middlings fed at the rate of 2 lbs. daily per 100 lbs. live weight at a cost of $25.23. All lots gained in weight except lot 1. The pigs farrowed in lot 4 were not so uniform and vigorous as those in the other lots.

A cross-breeding experiment with sheep.—The plan is noted.

Maintenance of breeding flocks of mutton and wool sheep.—Further notes are given on the progress of this work, begun in December, 1911. The only change made during the year was in the rations fed the ewes during the winter. The general conclusion from the season's feeding was that the lambs produced on the various rations were very similar and that the cost of alfalfa hay was greater than mixed hay. Comparisons are drawn between the Shropshire and the Delaine Merino ewes as shown by the 5½ years of investigation.

The maintenance of a beef breeding herd.—Previously noted in detail from Bulletin 138 (E. S. R., 35, p. 168).

Steer feeding experiments.—During the year 72 head of steers were fed under two lines of investigation. In the first, five lots of 12 steers each were used to test the feeding value of rations for medium weight cattle under Pennsylvania conditions. The results indicated a marked advantage in using silage as a roughage for feeding cattle. The steers receiving no corn except that in silage made an average daily gain per head of 2.08 lbs. during 140 days. The shrinkage with the silage-fed cattle was a little greater, while those receiving a heavy silage ration with a small amount of corn stover had the least shrinkage. Those on a heavy silage ration sold for a higher price and gave the greatest profit.

In a comparison of broken ear corn or shelled corn with corn-and-cob meal or corn meal with two lots of 6 steers each, the former had a larger amount of pork to its credit, but the latter produced heavier daily gains, a better finish, sold for a higher price, and made the greater profit.

Studies in the making of corn stover silage.—It was found that corn stover can be cut successfully in an ordinary silage cutter. In corn stover silage making, twice the amount of water by weight should be added. Chemical and bacteriological tests showed the same fermentations as in ordinary corn silage. Max-

imum temperature readings for over two months were 69° F., as high as in ordinary corn silage in some instances. While no feeding tests were made, the cattle ate the stover silage with relish and consumed more of it than dry fodder and with less waste and labor than with dry stover.

[Work in animal husbandry at the Nebraska Station] (*Nebraska Sta. Rpt. 1916, pp. VII–XI*).—Work of the station in sheep and cattle feeding is reported.

Sheep feeding.—In December, 1915, 300 Wyoming lambs were entered in a 75-day experiment to determine the amount of corn to be fed with alfalfa, the supplementary feeds best to use with corn, and feeding in the open *v.* feeding in sheds. The best results were obtained from feeding 0.86 lb. of corn daily with alfalfa. With corn silage added to the corn-alfalfa hay ration the animals showed more finish and made gains at an average cost of 4.95 cts. per pound, as compared with 4.9 cts. on the corn and alfalfa ration, 5.43 cts. for corn, oil meal, and alfalfa hay, 5.15 cts. for corn, cottonseed meal, and alfalfa hay, and 5.18 cts. for corn, cold pressed cottonseed cake, and alfalfa hay.

The addition of the supplementary feeds (oil meal, cottonseed meal, and cold pressed cottonseed cake) to the ration increased the gains sufficiently so that the profits per head were larger with their use. The lambs fed in the open consumed more feed, made greater gains, and returned a larger profit than those fed in sheds.

In August, 1916, Oregon lambs were divided into eight groups of 40 each to determine the relative gains and cost made in the dry lot, pasture, and on corn in the field. The results again showed the cheapest gains on pasture, 3.55 cts. per pound. In the dry lot the lambs on a heavy corn ration made an average profit per head of $1.65 and on a medium ration $1.34; on pasture a profit of $1.77; and where used to feed down corn in the field a profit of $2.46. Clipping the lambs increased the gains but reduced the selling price to a point making the practice unprofitable.

Cattle feeding.—An experiment was made with six lots of cattle comparing corn and alfalfa hay with corn, alfalfa hay, and silage, and with corn, alfalfa hay, and supplementary protein feeds. The average net profits per steer, including pork produced, were as follows: Ground corn and alfalfa hay, $11.18; shelled corn, alfalfa hay, and silage, $13.71; shelled corn and alfalfa hay, $14.22; shelled corn and cottonseed meal the last six weeks, $15.16; shelled corn, alfalfa hay, silage the first four weeks, and Tarkio molasses the last 14 weeks, $15.47; and shelled corn, alfalfa hay, and cottonseed meal, $16.79.

Wintering two-year-old steers preparatory to finishing on grass the following summer, R. E. Hunt (*Virginia Sta. Bul. 215* (*1917*), *pp. 3–15, figs. 5*).—The usual method of wintering steers in Virginia is on dry roughage and grain. The experiments reported covered three winters and compared the feeds commonly used with corn silage and combinations especially.

As concentrated feeds with silage, cottonseed meal and corn meal were used, and as roughage, mixed hay, wheat straw, and corn stover were used. Five lots of five steers each were employed and the rations varied for each year's work. The experiments were carried out in the open with sheds for shelter. The seasonal differences are noted and the gains and losses in weight displayed by graphs. From the three year's work the following conclusions are drawn:

In buying two-year-old cattle in the fall for fattening they were carried through the winter on a maintenance ration and made their gains on grass during the following summer. When the steers were wintered on silage they made more rapid gains on grass in the spring with practically no loss in weight in making the change, while steers wintered to gain flesh lost weight while becoming used to the watery and immature grass of early spring. Steers in

thin condition made rapid gains at first when turned on grass. Steers fed 40 lbs. of silage daily made the greatest gains at the lowest cost, while those fed corn stover and corn meal made the least gains at the greatest cost. The animals fed 45 lbs. of silage made smaller gains than those fed only 40 lbs. Replacing 10 lbs. of silage in the ration with 1 lb. of cottonseed meal gave as good results during the winter, but the steers did not do so well when they went to grass. Thirty-five lbs. of silage with 1 lb. of cottonseed meal was more satisfactory. Mixed hay was a better additional roughage with silage than either straw or stover.

The following suggestions are made: Winter 1,000-lb. steers to maintain equal weights until spring; winter 1,100-lb. steers to lose about 25 lbs. during the winter; and winter 1,200-lb. steers to lose about 50 lbs. by spring.

Preparation of corn for fattening two-year-old steers, H. O. ALLISON (*Missouri Sta. Bul. 149 (1917), pp. 35, figs. 11*).—The investigations reported were made to determine the most effective form in which corn can be fed to 2-year-old steers. The trials were made with 90 head of 2-year-old steers, 30 head of cattle in 5 lots of 6 each being used each season throughout a period of three years.

To rations made up of a nitrogenous concentrate, corn silage, and legume hay, there was added for lot 1 broken ear corn, lot 2 shelled corn, lot 3 crushed corn and cob, lot 4 corn-and-cob meal, and lot 5 ground corn. The nitrogenous concentrate consisted of cottonseed meal or cake and the legume hay of alfalfa for the first and third periods and clover for the second. As nearly as possible the proportion of corn to the nitrogenous concentrates was kept at 6 lbs. of the former (shelled basis) to 1 lb. of the latter. Pigs weighing from 100 to 125 lbs. followed the cattle to utilize the feed which would otherwise have been wasted, there being 4 pigs in lots 1 and 2, 3 in lot 3, and 2 in lots 4 and 5. The data in detail are given in a number of tables. The average results of three trials are shown as follows:

Results of fattening steers with corn in different forms.

	Lot 1.	Lot 2.	Lot 3.	Lot 4.	Lot 5
Average daily ration per steer:					
Corn ... lbs..	17.42	17.78	17.24	17.10	18.33
Nitrogenous concentrate ... do.	2.78	2.96	2.75	2.71	3.05
Corn silage ... do.	17.58	17.75	16.00	16.61	18.22
Legume hay ... do.	2.49	2.69	2.53	2.38	3.08
Average daily gain per steer ... do.	2.52	2.71	2.59	2.61	3.08
Gain made by cattle and pigs per bushel of corn fed ... lbs..	10.53	10.18	9.57	9.10	9.87
Percentage of gain per bushel of corn fed made by pigs ... lbs..	21.63	16.02	10.63	4.98	4.56
Dry matter fed per 100 lbs. gain made by cattle and pigs ... lbs..	762.44	842.31	877.78	936.42	873.38
Cost per 100 lbs. gain (pork credited) ...	\$9.21	\$9.63	\$10.03	\$11.24	\$10.25
Shrinkage per head in shipping ... lbs..	32.98	34.56	27.26	31.15	36.96
Net profit per steer ...	\$4.00	\$2.85	\$0.95	[1] \$1.17	\$2.42

[1] Loss.

Lot 5 (ground corn) brought the highest price per pound, while lot 4 (corn-and-cob meal) came second, and lot 2 (shelled corn) third. The higher price, however, was not enough to offset the reduced gain in weight per unit of feed and the expense of preparing the corn.

Corn silage with and without shelled corn in rations for fattening steers, H. O. ALLISON (*Missouri Sta. Bul. 150 (1917), pp. 24, figs. 7*).—Some of the results obtained from two years' experiments in fattening steers by the use of corn silage as a maximum and shelled corn and protein concentrates as a

minimum ration are reported. The first trial, made from December, 1915, to May, 1916, covered 133 days, the second, from December, 1916, to May, 1917, covered 130 days. The feeders were of good grade bought on the Kansas City market, and after fattening were sold on the Chicago market. The lots in the first trial consisted of 6 steers each, those in the second trial of 8 each. The feeding gains and profits are shown in the following table:

Results of fattening steers on corn silage with and without shelled corn.

	First trial.					Second trial.				
	Lot 1.	Lot 2.	Lot 3.	Lot 4.	Lot 5.	Lot 1.	Lot 2.	Lot 3.	Lot 4.	Lot 5.
Average daily ration per steer:										
Shelled corn..........lbs..	15.60	15.24	....	....	15.27	16.71	17.11	....	....	16.92
Cottonseed meal........do.	2.60	....	5.05	....	....	2.78	....	4.35	....	....
Linseed oil meal........do.	....	2.54	....	5.05	....	....	2.85	....	4.35	....
Corn silage.............do.	17.47	16.47	36.22	37.62	16.26	29.74	30.08	47.97	49.41	25.93
Alfalfa hay.............do.	3.69	2.27	3.00	4.03	3.90	3.25	3.78	5.69	5.82	3.94
Average daily gain per steer, pounds....................	2.72	2.45	1.97	2.38	2.20	3.03	3.26	2.40	2.46	2.64
Gain made by hogs per steer, pounds....................	38.66	51.10	[1] 6.40	3.10	36.33	84.95	106.58	1.78	5.16	66.50
Cost of feed per steer...........	$40.85	$38.63	$26.07	$27.44	$33.88	$86.01	$88.25	$44.79	$45.71	$77.12
Cost per 100 lbs. gain made by cattle (gain by hogs $8 per 100 lbs.).....................	$10.42	$10.58	$10.15	$8.57	$10.88	$19.01	$17.55	$14.28	$14.06	$19.68
Dressed beef........per cent..	63.53	64.19	62.38	61.33	62.58	60.60	61.10	59.30	58.40	60.50
Shrinkage per head in shipping..................lbs..	48.89	39.44	43.11	39.71	30.00	55.70	40.41	71.25	56.58	44.70
Net profit per steer............	$6.77	$9.32	$9.87	$14.56	$10.53	[1] $0.01	$10.07	$11.59	$15.62	$0.52

[1] Loss.

The results obtained in the above trials were based on the following prices: First trial, feeders $7.64 per 100 lbs., corn 70 cts. per bushel, corn silage $4.50 per ton, cottonseed meal and linseed oil meal $37 per ton, and alfalfa hay $14 per ton; second trial, feeders $8.45 per 100 lbs., corn $1.50 per bushel, corn silage $8.50 per ton, cottonseed meal and linseed oil meal $45 per ton, and alfalfa hay $15 per ton.

The records for lots 3 and 4 (without shelled corn) indicate the possibility of fattening from three to four steers per acre with corn fed as silage. While the average daily gain was not so large as when shelled corn was added to this ration it was satisfactory. The value of protein concentrates was shown by the record for lot 4, which produced gains at the lowest cost. Lot 3, with cottonseed meal in the ration, came second. The linseed meal ration, as compared with the cottonseed meal rations, showed a greater net profit per steer, and the gain made by hogs following the cattle was also greater. The results indicate that the difference in the market price of the cattle was not sufficient to justify the feeding of shelled corn in the first trial, but in the second it was justified with corn at $1 per bushel and silage at $6 per ton, but not with $1.50 corn and $8.50 silage.

The results of the two trials indicate that it is ordinarily advisable to add a high protein concentrate to a ration of shelled corn, corn silage, and alfalfa hay for fattening cattle.

Kentucky's opportunities as a sheep State, L. B. MANN (*Kentucky Sta. Circ. 18 (1917), pp. 107–116, fig. 1*).—Attention is called to the promising outlook in sheep husbandry brought about by the great decrease in flocks all over the world. In Kentucky during the past year there was a decrease of 77,000 head, and since 1913, a decrease of 165,000 head, or 12½ per cent of the total.

The leading factors favorable to sheep raising in the State are pointed out. The principal drawback is the danger from sheep-killing dogs.

Supplements to corn for fattening swine, W. L. ROBISON (*Mo. Bul. Ohio Sta., 2 (1917), No. 10, pp. 317–322, figs. 5*).—While corn growing and pork production are closely related industries, attention is called to the fact that, for the best returns in feeding, corn must be supplemented with feeds that make up its deficiencies; namely, protein and mineral matter. Experiments are reported in which the supplements to corn used were skim milk, tankage, linseed meal, and soy beans.

In an experiment lasting 70 days with three lots of pigs averaging about 60 lbs. each the following gains are reported: With corn and tankage, 9:1, the average daily gains per head were 0.83 lb. and the profit above the cost of feed $4.34; with corn and skim milk, 1:1, a daily gain of 1.16 lbs. and a profit of $14.28; and with corn and skim milk, 1:3, a daily gain of 1.024 lbs. with a profit of $10.23.

In another experiment lasting 105 days with 79-lb. pigs, the lot fed corn alone made an average daily gain per head of 0.881 lb. with a profit of $3.36; the lot fed corn and tankage, 9:1, an average daily gain of 1.709 lbs. with a profit of $28.31; while the third lot fed corn and skim milk, 1:1, averaged 1.635 lbs. daily with a profit of $26.99.

In a third experiment lasting 105 days with 43-lb. pigs the lot fed corn alone made an average daily gain of 0.35 lb. and lost $10.21; those on corn and tankage, 9:1, a gain of 0.899 lb. daily and a profit of $12.38; those on corn and skim milk, 1:1, a gain of 0.956 lb. daily and a profit of $14.50; and those on corn and skim milk, 1:3, a gain of 1.328 lbs. daily and a profit of $22.07.

Based on two pigs in each lot, the dressing percentages with the lot receiving tankage were such as to make them worth 2 per cent more than the corn-alone lot, and those with skim milk in the ration 3.7 per cent more.

In an experiment with 145-lb. pigs fed for 84 days the following results were noted: With corn alone the pigs made an average daily gain of 1.47 lbs. per head and a profit of $10.62; with corn and tankage, 9:1, an average daily gain of 2 lbs. and a profit of $22.72; with corn and linseed meal, 5:1, an average daily gain of 1.85 lbs. and a profit of $19.64; and with corn and ground soy beans, 5:1, an average daily gain of 1.62 lbs. and a profit of $15.60.

The above results were obtained with the feeds valued as follows: Corn, $1.68 per bushel; tankage, $80 per ton; skim milk, $10 per ton; soy beans and linseed meal, $65 per ton; and hogs, $15 per 100 lbs.

It is pointed out that in selecting supplements to feed with corn the prices of the materials should have due consideration; also other factors such as the age of the pigs. Skim milk, for example, gives higher returns with young pigs than with older ones.

The disposal of city garbage by feeding to hogs, F. G. ASHBROOK and J. D. BEBOUT (*U. S. Dept. Agr., Office Sec. Circ. 80 (1917), pp. 8, pl. 1*).—The Department is making a study of the handling of garbage, with the object of reducing the cost of handling and utilizing a waste product as a productive material. From the statistics of 17 cities it was found that in seven feeding their garbage to hogs the annual cost per capita was 11.6 cts., while in 10 disposing of it by other methods the cost was 33.7 cts.

The equipment for a garbage-feeding plant for hogs is shown and described. The collection and handling of garbage, the feeding and breeding of hogs using garbage, and the character of the meat are discussed.

The horse: His breeding, care, and treatment in health and disease, H. C. MERWIN (*Chicago: A. C. McClurg & Co., 1917, pp. XIV+281, pls. 13*).—A practical treatise on the breeding, care, and training of the horse, and a descrip-

tion of types and breeds. Disease and injuries are treated in part 2. A bibliography is appended.

Selection of breeding draft horses, C. N. ARNETT (*Montana Sta. Circ. 69 (1917), pp. 17–32, figs. 15*).—This circular treats in a general way of the judging and selection of draft breeding stock.

Distribution of public service stallions in Wisconsin in 1917, A. S. ALEXANDER (*Wisconsin Sta. Bul. 283 (1917), pp. 64, figs. 4*).—The total number of pure-bred sires has fallen from 1,814 in 1916 to 1,723 in 1917, while stallions of all kinds have fallen from a total of 3,062 in 1916 to 2,804 in 1917. However, the percentage of pure-bred stallions has increased from 59.2 in 1916 to 61.5 in 1917. It is estimated that there were 715,000 horses in Wisconsin January 1, 1917, with an average value of $120 each.

A directory is given of the owners of public service stallions and jacks in the State.

The feminization of male birds, H. D. GOODALE (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 3 (1917), No. 9, pp. 68, 69, 70*).—An account of the successful feminization of four cockerels by completely castrating and then implanting fresh ovarian tissue from related females.

In the four cases it was noted that (1) the birds had the plumage of the hen throughout, (2) the comb and wattles grew much more than those of the capon and reached a size approximately that of the hen, (3) the spurs developed apparently nearly as much as in the normal male of corresponding age, but as none of the living birds were sufficiently old no statement relative to their continued growth with advancing years could be made, (4) the general build of the birds was more like that of the cock than that of the hen, in that they were rather coarse and rangey, but not more so than some individual hens, and (5) one of the birds was quite masculine and two were practically neutral in behavior. The fourth died before maturity.

The condition of implanted tissue has been ascertained in two instances. It was found that several pieces of the implanted tissues had been attached at various places. In some the blood supply was well developed and some evidence of increase in the size of the ova was noted, the largest reaching a size of 3 mm. There has been no evidence, however, that the ova had exceeded this size.

Sex-linked inheritance of [spangling in poultry], E. H. RUCKER (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 3 (1916), No. 1, pp. 6, 7*).—Results are given of experiments which indicate that the factor of spangling in the Silver Spangled Hamburg is sex-linked. However, the inheritance may be modified by the presence of disturbing factors.

In the experiments the initial crosses were made reciprocally between the Silver Spangled Hamburg and the Brown Leghorn. The males derived from reciprocal crossings were practically alike, having spangled bodies with black tails, with the exception of four males which were entirely black. These black cocks later gave the same breeding results as their spangled brothers. The daughters of the reciprocal crosses were strikingly different. Those from Brown Leghorn ♂ × Silver Spangled Hamburg ♀ were black with various degrees of brown stippling on the wings, while those from Silver Spangled Hamburg ♂ × Brown Leghorn ♀ had peculiar grayish feathers, showing crescentic penciling with black and very distinct black spangles at the tip. The daughters then inherited the spangling from the sire's side only. In the F_2 generation all crosses followed the sex-linked mode of inheritance.

These results are in accordance with the hypothesis that in poultry the male is homozygous for sex and the female heterozygous, and that the factors for certain characteristics are linked with the factors for sex.

The correlation between body pigmentation and egg production in the domestic fowl, J. A. Harris, A. F. Blakeslee, and D. E. Warner (*Genetics, 2 (1917), No. 1, pp. 36–77, figs. 16*).—The authors, in consultation with W. F. Kirkpatrick, have made a minute analysis by means of biometric formulas of data noted (E. S. R., 33, p. 172) on the relationship between body pigmentation and egg production.

The pigment measurements were restricted to the percentage of yellow occurring in the ear lobe of White Leghorns as determined by the color top. The White Leghorns studied were 309 birds entered in the 1913–14 and 375 birds in the 1914–15 International Egg-laying Contest held at Storrs, Conn. The egg records cover a period of one year, November to October, inclusive, of the pullet year. Pigmentation determinations were made in October.

Series of constants for mean fecundity and for variation and correlation in fecundity in the White Leghorn are given. The coefficient of correlation between October ear-lobe color and the egg production of the year was found to be —0.55. The results for the two years were in close agreement. On the average birds differing by 5 per cent in the amount of yellow in the ear lobe differed by about 7 eggs in their annual production. For example, birds showing only from 10 to 20 per cent of yellow in their ear lobes in October had laid on an average about 185 eggs, whereas birds having from 55 to 65 per cent of yellow had laid an average of about 130 eggs during the year.

The correlation coefficients between October pigmentation and the egg production of each month of the year were negative, and almost without exception these coefficients were significant in comparison with their probable errors. Beginning with a correlation of about —0.15 in November, the intensity of the relationship increased numerically to about —0.25 in December, after which it fell to practically zero in March and April, and then increased in (negative) intensity rapidly to about —0.75 in October.

The hypothesis that the growth of the egg abstracts certain substances (in the present case, yellow pigment) from the body tissue, or precludes its being deposited there, would at once account for the generally higher correlation between measures made at more closely associated periods of time. If this view be the correct one, egg production must be regarded as the (relatively) independent variable, and intensity of pigmentation as the dependent variable. Egg production would then be looked upon as the chief proximate cause of the observed intensity of pigmentation.

One phase of the distribution of egg production in single comb White Leghorns, L. E. Card (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 3 (1917), No. 5, pp. 39, 40*).—The trap nest records of 106 White Leghorn hens at the Connecticut Storrs Station are discussed in their bearing upon the value of first year egg records as a basis for selection for high egg production (E. S. R., 32, p. 73). During the first year (November 1 to October 31) these hens averaged 147 eggs each, the highest record being 255 and the lowest 69 eggs. For the second year the average egg production was 83 per bird, the highest being 162 and the lowest 1 egg. The high producers during the first year continued to be the high producers during the second year.

Chicken rearing at Morden Hall, 1914–15 (*Jour. Bd. Agr. [London], 23 (1916), No. 6, pp. 563–576*).—Some practical demonstrations in rearing chickens by simple and inexpensive methods are reported. The trials covered several years' experience in the production of about 3,000 chickens each season.

During three years the eggs were bought from different sources and the average of hatching in incubators was only 41 per cent. The following year the eggs were produced at home but with no lessening of the percentage lost in incubation. This was contrary to general experience and attributed to dis-

ease in the breeding stock. When such large numbers of eggs are incubated, it is probably more economical to use a composite incubator and a form of brooder more easily inspected and requiring less attention than a number of small ones. The personal factor in chicken raising is emphasized.

In 1913–14, 1,063 birds were fattened, gaining 1.23 lbs. each at a cost in energy value per pound of 8,650 calories. In 1914–15, 1,171 birds gained 0.94 lb. each at a cost of 6,750 calories.

The fattening proved profitable in both years, but attention is called to the fact that it requires skill, and a small holder must decide for himself whether to fatten chickens or sell off the runs.

DAIRY FARMING—DAIRYING.

Economy of production by dairy cows.—A comparison of large and small cows in milk yield, R. I. Grady (*Mo. Bul. Ohio Sta., 2 (1917), No. 10, pp. 334–338*).—Data here reported were collected by the station from dairymen in various parts of the State. These dairymen kept accurate records of the amounts of feeds supplied and of the milk produced by each animal. For the sake of accuracy, only the months November to April, inclusive, when the cows were not on pasture, were considered.

It was found that there was a steady and considerable increase in the amount of feed consumed for each pound of milk, solids, and fat produced from month to month as the lactation period advanced. Approximately three times as much feed per unit of product was required in the tenth month as in the first.

Comparing Holsteins and Jerseys, it was noted that when feed alone was considered the Holsteins produced milk more economically throughout the entire lactation period. The Jerseys had a slight advantage in economy of producing solids and a decided advantage in economy of producing fat. On the basis of digestible nutrients consumed, if the Jerseys were considered 100 per cent efficient in producing milk, solids, and fat, the Holsteins were 116.5 per cent efficient in producing milk, 93.4 per cent efficient in producing solids, and 74.5 per cent efficient in producing fat. When the amount of nutrients required for maintenance was deducted from the total amount consumed the Holsteins made a better showing. On this basis, if the Jerseys were considered 100 per cent efficient, the Holsteins were 139.5 per cent efficient in producing milk, 112.1 per cent efficient in producing solids, and 89.2 per cent efficient in producing fat. When production and feed consumption per 1,000 lbs. live weight of the animal were considered, it was found that the Jerseys consumed 19.6 per cent more dry matter and 18.2 per cent more digestible nutrients and produced 1.2 per cent more milk, 25.6 per cent more solids, and 59.3 per cent more fat than the Holsteins.

The effect of open-shed housing as compared with the closed stable for milk cows (*Pennsylvania Sta. Bul. 147 (1917), pp. 15–17*).—Noted from another source (E. S. R., 35, p. 571).

Silage alone compared with silage and mixed hay as roughage for dairy cows (*Pennsylvania Sta. Bul. 147 (1917), p. 15*).—Continuing earlier work (E. S. R., 35, p. 571), cows were fed 1 lb. of grain per 3 lbs. of milk and all the roughage they would consume. During the first year the milk yield decreased 0.14 lb. during the feeding period of 11 weeks when hay and silage were fed, and 1.64 lbs. when silage alone was fed. In this test 45 lbs. silage per head was fed twice daily to both lots and one lot received 5 lbs. hay in addition. When hay was fed in addition to silage, the cows consumed practically the same amount of silage as those fed silage only.

During the second test silage was fed to one lot three times a day. The other lot received silage twice and hay once a day. The lot receiving silage alone consumed an average of 52 lbs. of silage per head per day, while the lot receiving on an average 6 lbs. of mixed hay consumed 36 lbs. of silage. During the second year the yield of cows fed hay and silage decreased 1.94 lbs. per cow during the feeding period of 11 weeks. The decrease for cows fed silage only was 3.3 lbs. per cow.

Care and management of the dairy herd, R. S. Hulce and W. B. Nevens (*Illinois Sta. Circ. 204* (*1917*), *pp. 3–29, figs. 13*).—General directions are given for the care and management of dairy cows, including notes on the age to breed heifers, care of the herd bull, common diseases of dairy cattle, and the keeping of herd records.

Cow testing associations (*Nebraska Sta. Rpt. 1916, pp. XI, XII*).—Brief mention is made of the work of the four cow testing associations in the State, each of which includes about 25 herds.

In the Gage County association 40 cows were found unprofitable and sold during the first year. Tabulated data show that the 10 best cows in this association made a total profit of $1,032.88, and the 10 least profitable cows a profit of $57.82 during the year. The 15 best cows in the association had an average annual production of 8,555.5 lbs. of milk and 365.4 lbs. of milk fat as compared with 3,105.6 lbs. of milk and 129.1 lbs. of fat for the 15 poorest cows.

The average butter production of 800 cows in another association was increased 50 lbs. per cow in three years.

Progress report on the production and distribution of milk, E. Mead (*California Sta. Circ. 175* (*1917*), *pp. 16*).—A preliminary report of studies of the economics of production and distribution of milk for the supply of the San Francisco Bay cities. Information given in 36 out of about 100 replies to questionnaires sent to producers in different parts of the State is summarized.

The average yearly production per cow for these 36 dairies is 759 gal. of milk and 223 lbs. of milk fat, as against an average of 500 gal. of milk and 150 lbs. of milk fat for the State. It is noted that the average cost of producing milk increased from 16.4 cts. per gallon in 1916 to 22.7 cts. in July, 1917, while the price received by producers during the same period advanced from 16.4 to 19 cts. per gallon. Among the causes of increased cost of production it was found that the wholesale price of feeds ordinarily used by dairymen increased 38.2 per cent during the above period.

Information is also given regarding cost of distribution, as obtained from 10 distributors in Oakland and Berkeley. The cost of distributing milk by these dealers was 16.53 cts. per gallon, of which 3.78 cts. was due to bad debts, making a total for production and distribution of 39.23 cts. per gallon. "This would seem to show that 40 cts. a gallon was a sufficient price under the conditions existing in June last, and that what was needed was not an increased price to the consumer, but a readjustment of charges between the producer and the distributor."

These data are compared with data on cost of production and distribution of milk in southern and central California. The author discusses the present uneconomical methods of distributing milk and suggests the scope of an inquiry into the means of correcting such methods.

"What is needed in the San Francisco Bay cities is the creation of some expert authority to study whether the present location of our dairying districts makes possible provision of a milk supply as cheaply as it could be furnished from some other district or districts where land is cheaper even if farther removed. . . . The economics of distribution should be studied, not to determine in what direction present distributors have failed, but what could

be saved by a carefully planned distributing system which would eliminate duplication of routes, needless pasteurizing plants, and overhead charges. Nothing will be gained by investigations which stop with criticism of methods and practices of those now engaged in business. Considering the limitations under which they worked, they have done as well as could be expected, and exactly what was expected. The essential thing to be recognized is that leaving this complex problem wholly to private enterprise is an economic mistake which, sooner or later, will have to be corrected."

A report on the milk situation in the Pittsburgh district (*[Pittsburgh, Pa.]: Penn. Milk Com., 1917, pp. 15*).—A condensed report is presented of testimony given before the Governors' Tri-State Milk Commission at a public hearing in Pittsburgh, Pa., August 28, 1917, on the production and distribution costs of milk for the Pittsburgh market.

Itemized accounts indicate that for a large number of herds in the Ohio district from which milk is shipped into Pittsburgh the cost of producing milk during 1917 was 3.89 cts. per pound for cows averaging 5,000 lbs. of milk per annum, and 3.24 cts. for those producing 6,000 lbs. of milk. Individual herd records from Pennsylvania show a cost of producing milk during this period varying from 2.16 to 2.67 cts. per pound. Cow-testing association records in five Pennsylvania counties indicate that the cost of producing milk during the period from April 1 to August 1, 1917, varied from 1.99 to 2.74 cts. per pound.

According to the figures given the farmers have been selling milk at a loss, while the distributors made during the six months ended June 30, 1917, a net profit of about 3 per cent on their milk sales. Some of the forces that, singly or combined, tend to fix the price of milk are discussed.

The composition of milk, P. S. Arup, H. C. Huish, and H. D. Richmond (*Analyst, 42 (1917), No. 493, pp. 118–124*).—Monthly and yearly averages of analyses of 19,317 samples of milk received from farms in 1914, 16,118 samples in 1915, and 14,286 samples in 1916 are tabulated. The yearly average of morning and evening milks and the numerical mean between the two are given in the following table:

Average composition of milk during 1914, 1915, and 1916.

Year.	Morning milk.				Evening milk.				Mean.			
	Sp. gr.	Total solids.	Fat.	Solids-not-fat.	Sp. gr.	Total solids.	Fat.	Solids-not-fat.	Sp. gr.	Total solids.	Fat.	Solids-not-fat.
		Per ct.	Per ct.	Per ct.		Per ct.	Per ct.	Per ct.		Per ct.	Per ct.	Per ct.
1914	1.0318	12.40	3.59	8.81	1.0316	12.64	3.84	8.80	1.0317	12.52	3.72	8.80
1915	1.0319	12.53	3.67	8.86	1.0318	12.71	3.85	8.86	1.0319	12.62	3.76	8.86
1916	1.0319	12.55	3.70	8.85	1.0317	12.79	3.94	8.85	1.0318	12.67	3.82	8.85

In 1914 the minimum fat production occurred in May, and appreciable numbers of samples falling below 3 per cent were noted in the morning milks from February to August, inclusive. In 1915 and 1916 the minimum occurred in June, and appreciable numbers of samples falling below 3 per cent occurred in the morning milks from April to July, inclusive. In the three years the highest percentage of fat occurred in November. The percentage of solids-not-fat was low in July and August and normal in September. A decreasing difference between the morning and evening percentages of fat is noted and discussed.

Principles and practice of milk hygiene, L. A. KLEIN (*Philadelphia and London: J. B. Lippincott Co., 1917, pp. X+329, pls. 5, figs. 33*).—This book, which is intended primarily for a text for students in milk hygiene, treats of the physiology of milk secretion; the properties of colostrum and its detection; the physical and chemical properties of milk, its microscopic appearance, the ferments and enzyms it contains, and the bacteria with which it may be contaminated; defects in the consistency, odor, taste, and color of milk due to nonbacterial causes; diseases of cattle transmissible to man through milk, or which may make milk harmful to man, and diseases of man transmissible through milk; dairy inspection; pasteurization; and methods of examining milk. The appendix gives methods and standards for the production and distribution of certified milk.

Safe milk.—An important food problem, E. A. SWEET (*Pub. Health Rpts. [U. S.], Sup. 31 (1917), pp. 24*).—A general discussion of the production and handling of sanitary milk, the topics dealt with being the composition of milk, abnormal qualities of milk, milk adulteration, accidental impurities, bacteria in milk, and milk-borne diseases and their prevention.

Report of an investigation into the hygienic quality of the milk supplied to babies attending certain schools for mothers, with suggestions to those responsible for the feeding of children, W. BUCKLEY (*Nat. Clean Milk Soc. [London], [Pub.], No. 10 (1917), pp. 18*).—Results are given of the examination of samples of milk from 27 dairymen in London supplying milk for bottle-fed babies. The bacterial content of these milk samples varied from 98,000 to 104,300,000 per cubic centimeter. Organisms of the *Bacillus coli* group were present in all the samples examined, and tubercle bacilli were found in two of the samples and in one sample of certified milk.

Suggestions are given for the improvement of the milk supply of cities in Great Britain and Ireland.

Variations in cream tests.—Differences between butter and butter fat, W. A. WILSON (*Saskatchewan Dept. Agr. Bul. 43 (1916), pp. 15, figs. 2*).—This bulletin gives information concerning the variation of the cream test and the difference between butter and milk fat.

In seven tests, in each of which mixed milk was divided into three lots and separated at temperatures of 98, 80, and 70° F., all other conditions being uniform, the fat content of the cream increased as the temperature of the milk was decreased. In one of the tests 24 per cent cream was separated from milk at a temperature of 98° and 35 per cent cream at a temperature of 70°. The fat content of the skim milk was higher for the cooler lots of milk.

Six lots of milk were separated at speeds of the separator crank varying from 50 to 62 revolutions per minute, the separators being adjusted to a correct speed of 60 revolutions per minute. In these tests the fat content of the cream decreased with the speed of the separator. In one trial the test dropped from 41 to 22 per cent when the crank speed was reduced from 60 to 50 revolutions per minute.

In another series of seven trials cream tests ran from 1 to 5 per cent higher when the receiving can of the separator was almost empty than when the receiving can was full. Other causes for variation in cream tests are mentioned.

In order to demonstrate how the weight of butter churned can be increased when quality is not considered, a series of five churnings was made, in each of which one lot of cream was divided into two parts of equal weight and churned under different conditions. In one test 26 lbs. of 41 per cent cream, at a temperature of 55°, was churned in 25 minutes and made 8 lbs. 2 oz. of butter and 17 lbs. 4 oz. of buttermilk which tested 0.15 per cent fat. The other lot of

26 lbs. of this cream, at a temperature of 60°, was churned in 15 minutes and made 9 lbs. 2 oz. of butter and 16 lbs. of buttermilk testing 0 3 per cent fat.

Acidity and butter, I, F. W. Bouska (*N. Y. Produce Rev. and Amer. Cream., 44 (1917), No. 23, pp. 890, 892*).—A discussion of the relation of acidity of cream to quality of butter, together with detailed information as to the methods employed by creameries in neutralizing cream with limewater and sodium carbonate.

Butter makers' short course, Mr. and Mrs. W. J. McLaughlin (*Owatonna, Minn.: Authors, 1917, pp. 168, figs. 36*).—This is a manual of information on creamery butter making and creamery operation, based for the most part on the experience of the authors.

An ice cream laboratory guide, W. W. Fisk and H. B. Ellenberger (*New York: Orange Judd Co., 1917, pp. IV+92*).—This is a brief outline of laboratory exercises prepared for the purpose of helping students apply the scientific principles of ice cream manufacture.

Third annual report of the creamery license division for the year ended March 31, 1917, R. E. Caldwell, T. H. Broughton, and S. L. Anderson (*Indiana Sta. Circ. 63 (1917), pp. 3–44, figs. 4*).—A report of the activities of the creamery license division of the station during the year, including lists of licensed testers and dairy products manufacturing plants in the State and rules governing the enforcement of State creamery license law.

Dairy division, D. Cuddie (*Ann. Rpt. Dept. Agr., Indus. and Com., New Zeal., 1917, pp. 30–38*).—This is a review of the dairy industry of New Zealand for the year ended March 31, 1917, including statistics on butter and cheese grading and exportation.

VETERINARY MEDICINE.

[Report of the] department of veterinary science, J. B. Paige (*Massachusetts Sta. Rpt. 1916, pp. 89a–92a*).—Experiments in the prevention of hog cholera were conducted in a herd of from 75 to 150 hogs that were fed upon garbage from a source which on two previous occasions had caused outbreaks of hog cholera. A part of the herd in which an artificial immunity had not been established by means of serum and virus was treated by the simultaneous method, the Globulin preparation of serum being used, and another lot was treated with a refined Amber Serum. The Globulin preparation showed an advantage over the usual antihog-cholera serum and the refined Amber Serum gave very satisfactory results.

The status of the work with *Bacterium pullorum* relating to the specificity of its antibodies, with special reference to the agglutinins; to toxins elaborated and their relation to specific conditions in adult birds; and to the production of antibodies, with special reference to potency and rate of production, is briefly reported upon. The investigations have shown that the toxin is endotoxic and that it is most intimately connected with the bacterial cell.

The suppression and eradication work with bacillary white diarrhea in fowls shows the agglutination test to be most accurate and reliable. The disease has been completely stamped out in the flocks that have been tested during the past two years and in which the directions for the handling of the flocks have been carried out. Of the 14,851 birds tested, owned by 78 different parties in 57 different towns scattered throughout the State, only 2,207 gave positive reaction.

Fourteenth annual report of the Minnesota State Live Stock Sanitary Board for the year ended July 31, 1917, S. H. Ward (*Ann. Rpt. Minn. Live Stock Sanit. Bd., 14 (1917), pp. 18*).—The occurrence of and work with the more important infectious diseases of live stock are reported.

The advantages of testing pure-bred herds for tuberculosis are discussed. Eradication work with tuberculosis was actively carried on, especially among the pure-bred herds of cattle. Almost one-half of the tuberculous pure-bred cattle which were slaughtered during the year were found to have been imported with a certificate of health or as calves. With the view to protecting buyers a regulation was adopted requiring all imported pure-bred cattle to enter quarantine at destination, pending a retest within 60 days, unless the cattle were from accredited tuberculosis-free herds. The plan of listing tuberculosis-free herds has resulted in placing over 80 pure-bred herds on the list. During the year 61,727 cattle were tuberculin tested of which 1,335 reacted, almost all of which have been appraised and slaughtered.

Annual report for 1916 of the principal of The Royal Veterinary College, J. McFadyean (*Jour. Roy. Agr. Soc. England, 77 (1916), pp. 197–206, figs. 2*).—This report, which deals with the occurrence of infectious diseases of live stock, includes tabular data showing the outbreaks for the years 1911 to 1916, inclusive, of anthrax, glanders, sheep scab, and hog cholera. A brief summary is given of investigations made of Johne's disease, more extended reports of which have been noted from other sources (E. S. R., 36, p. 382; 37, p. 479).

Live stock sanitary laws of Montana; also rules and regulations and orders of the Montana Live Stock Sanitary Board (*Helena, Mont.: State, 1917, pp. 136*).—"The rules and regulations of the Montana Live Stock Sanitary Board conform as closely as possible to the rules and regulations of the Bureau of Animal Industry of the U. S. Department of Agriculture. . . . All proclamations and orders heretofore promulgated but not contained in this pamphlet have been rescinded."

Quarantine and general regulations of State of New Mexico (*Albuquerque, N. Mex.: Cattle Sanit. Bd., 1917, pp. 8*).—This gives the regulations of New Mexico governing admission, transportation, and inspection of cattle, horses, mules, asses, hogs, and hides, effective July 1, 1917.

Iron as an antidote to cottonseed meal injury, W. A. Withers and F. E. Carruth (*Jour. Biol. Chem., 32 (1917), No. 2, pp. 245–257, figs. 4*).—"Four feeding experiments with pigs have shown that iron salts have a decidedly beneficial action in preventing cottonseed meal injury. Much larger quantities of meal are consumed, deaths have been postponed or averted, and better gains have been made when an iron salt is added to the feed.

"Wood ashes apparently have no antidotal action in averting death, but as the lot receiving ashes made much better gains it is possible that this is due to improvement of the inorganic part of the diet composed of corn and cottonseed meal.

"The suggestion is made that the iron salts combine with, or facilitate oxidation of, the harmful substances in cottonseed meal. Iron salts have an antidotal action toward cottonseed meal poisoning of rabbits and swine.

"By thus controlling the toxic factor, it is shown that cottonseed meal injury is not due to a lack of 'vitamins' or to deficiencies in calcium, sodium, and chlorin, which ash analyses might lead one to suspect as the limiting mineral factors in a diet of cottonseed meal and corn."

Investigations on the prevention of nuisances arising from flies and putrefaction, F. W. Foreman and G. S. Graham-Smith (*Jour. Hyg. [Cambridge], 16 (1917), No. 2, pp. 109–226, pls. 5, figs. 7*).—In the first part of this paper the authors summarize the preliminary experiments and observations which led them to consider that coal-tar creosote oil, alone or combined with other reagents, would prove of great value in the prevention of putrefaction in exposed bodies, the deodorization of putrefying carcasses, the destruction of fly maggots in animal refuse and manure, and the prevention of nuisances caused

by flies. In the second part the results of their investigations in regard to certain phenomena, such as the production of gas and odors, the exudation of fluid, and chemical changes in the tissues, which precede or accompany the distintegration of the principal constituents of the body under various conditions, are recorded. In part 3 are considered the actions of various coal-tar oils and their constituents on maggots and the results of treating carcasses of small and moderate-sized animals in the open. Part 4 records the results of the use of creosote oil mixtures.

Pathologic conditions noted in laboratory animals, F. C. Mann and S. D. Brimhall (*Jour. Amer. Vet. Med. Assoc., 52 (1917), No. 2, pp. 195–204, figs. 9*).—The autopsical findings of a number of laboratory animals used for experimental purposes are reported. The desirability of using only normal animals for experimental purposes and the importance of comparative pathology in experimental work is noted.

The treatment of infected wounds, A. Carrel and G. Dehelly (*Le Traitement des Plaies Infectées. Paris: Masson & Co., 1917, pp. 179, pls. 6, figs. 76*).—An explanation of Carrel's method of treating wounds in which Dakin's hypochlorite solution is used.

The treatment of infected wounds, A. Carrel and G. Dehelly, trans. by H. Child (*London: Baillière, Tindall & Cox, 1917, pp. IX+238, pls. 6, figs. 76; rev. in Vet. Jour., 73 (1917), No. 506, pp. 300, 301; Jour. Amer. Med. Assoc., 69 (1917), No. 19, p. 1645*).—An English translation of the above noted work.

The antiseptics and the war, L. Gershenfeld (*Amer. Jour. Pharm., 89 (1917), No. 11, pp. 487–496*).—A discussion of the newer antiseptics that have been used in the treatment of wounds.

Report on the use of Dakin's solution, H. E. Kingman (*Jour. Amer. Vet. Med. Assoc., 52 (1917), No. 2, pp. 185–188*).—The results of the use of Dakin's solution in 13 cases are reported. The technique of Dufresne (Daufresne) as described by Eakins (E. S. R., 37, p. 477) was used in all the cases.

The results indicate that in reasonably fresh wounds such as wire cuts and other accidental wounds serious infection can be controlled and the time of healing materially shortened. The solution has also been found satisfactory for use on the arms and hands and external surfaces in obstetrical operations and the removal of secundines. It has also been used as a first step in the preparation of the hands and the fields of operation.

The preparation of vaccines on a large scale, J. Cunningham, H. C. Brown, and K. R. K. Iyengar (*Indian Jour. Med. Research, 5 (1917), No. 1, pp. 1–18, pls. 14*).—This is a general description and discussion of the preparation of vaccines at the Central Research Institute in India.

Toxicity of certain preservatives used in serums, viruses, and vaccines, J. P. Leake and H. B. Corbitt (*Pub. Health Serv. U. S., Hyg. Lab. Bul. 110 (1917), pp. 35–45, figs. 2*).—From the results of the study reported there appears to be no definite minimum lethal dose of the disinfectants studied (phenol, tricresol, various commercial cresols, and glycerin), since some of the experimental animals survived doses twice the size of those which killed a considerable proportion. Considering, however, the minimum lethal dose to be the amount necessary to kill 80 per cent of the animals on a given dose, phenol was found to have a minimum lethal dose of 0.00037 gm. per gram weight of mouse. The tricresol was found to have the same value as phenol, and the toxicity of either was found not to be lessened when they were diluted with normal horse serum. The toxicity of glycerin, calculated on the same basis, was found to be approximately 0.012 gm. per gram weight of mouse. The toxicity of glycerin mixed with phenol or cresol was found to be slightly higher than that of pure glycerin.

The results indicate that in determining the toxicity coefficient of coal-tar disinfectants at least five mice should be used on each dose. Male mice were roughly 20 per cent more susceptible to the coal-tar disinfectants than females.

The transmission of antibodies (agglutinins and complement-fixing) from mother to fetus in utero, I. F. HUDDLESON (*Cornell Vet., 7 (1917), No. 4, pp. 284–291*).—The investigation reported deals with a comparison of the blood reaction of aborted fetuses and their respective dams, pregnant cows and their fetuses, and new-born calves and their respective dams. The technique used in the study was that previously described by the author (E. S. R., 37, p. 79).

The results show that there is no relation between the bacterial antibodies produced in the blood of the dam and that of the aborted fetus, fetuses taken from pregnant cows, and new-born calves. It appears that the agglutinins and complement-fixing bodies are not transmitted from mother to fetus in utero. "If there is a resistance to an infection conferred to the offspring born of an immune mother, this resistance can not be detected by means of the agglutination and complement-fixation tests when applied to the blood of the offspring."

Differentiation of the paratyphoid-enteritidis group, II, E. O. JORDAN and RUTH VICTORSON (*Jour. Infect. Diseases, 21 (1917), No. 6, pp. 554, 555*).—In continuation of the work previously noted (E. S. R., 37, p. 275) the authors find that in lead acetate agar "all typical paratyphoid A strains fail to blacken the medium in from 18 to 24 hours. All strains of *B. enteritidis* give a positive reaction. The great majority of *B. paratyphosus* B strains give a consistently positive reaction while all *B. suipestifer* strains are negative. Five strains of porcine origin, belonging to the *B. paratyphosus* B type, are not constant in their reactions, but these are the same strains that in the [senior author's] earlier study have been found variable and irregular in other respects."

Conglutination test for the diagnosis of glanders, H. W. SCHOENING (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 3, pp. 65–75*).—The author briefly reviews the literature and describes the technique of the conglutination test, as used in the work reported, in detail. The technique used was similar to that reported by Pfeiler and Weber.[1]

In a comparative study of 341 samples of horse serum, 137 were positive, 190 negative, and 14 doubtful, to the complement fixation test; while 150 were positive, 182 negative, and 9 doubtful, to the conglutination test. Postmortem data were not obtained from all the cases, but those samples in which positive results were obtained to both tests were, in the majority of cases, from animals which yielded a positive or suspicious reaction to the ophthalmic mallein test or were undoubtedly affected with glanders.

Of 115 samples of mule serum, 32 reacted positively, 63 negatively, and 20 were doubtful, to the complement fixation test; while 51 were positive, 63 negative, and 1 doubtful, to the conglutination test.

The conglutination test for glanders is considered a specific complement deviation reaction. Since the test is more sensitive than complement fixation, absolute accuracy in the technique, both qualitatively and quantitatively, is necessary to obtain reliable results. The test is considered to be superior to the complement-fixation test for the testing of mule sera and horse sera possessing nonspecific complement-fixing bodies. Since no single test is infallible, the conglutination test should be used in conjunction with the complement fixation and agglutination tests.

The summarized data are submitted in tabular form.

The glycerin bouillon reaction curve of tubercle bacilli as recorded by the Bovie potentiometer, L. FROTHINGHAM (*Jour. Med. Research, 37 (1917), No. 2,*

[1] Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 5 (1913), No. 4, pp. 255–262.

pp. 269–275, pls. 3, figs. 2).—The author concludes that for practical purposes, having in mind only an aid to the identification of types of tubercle bacilli, the value of the potentiometer test is not commensurate with the cost of the instrument or with the amount of work and time required to complete a test.

The reactions to human and bovine tuberculin applied by the method of von Pirquet in cases of tuberculous disease of the bones and joints, H. J. Gauvain (*Lancet [London], 1917, II, No. 14, pp. 519–521*).—The results of the investigation reported showed that local reactions to inoculations of both the human and bovine tuberculin were invariably present in all cases from which tubercle bacilli had been isolated from the pus. The reaction, although invariably present, varied within wide limits as regards degree. Weakly and cachectic patients usually reacted feebly, while the strong and vigorous patients exhibited wide differences in the degree of their reactions. The quantitative von Pirquet test was found to be of no value in forming an estimate of the severity of the infection and was of little prognostic value. The type of tubercle bacillus with which the patient was infected could not be differentiated by the nature of the reaction to the tuberculin employed.

The susceptibility of Indian milch cattle to tuberculosis, W. G. Liston and M. B. Soparkar (*Indian Jour. Med. Research, 5 (1917), No. 1, pp. 19–71, pls. 25, figs. 22*).—The object of the experiments reported was to ascertain the extent to which Indian cattle, which are seldom found to suffer from natural tuberculosis, are susceptible to the action of the bovine tubercle bacillus when injected subcutaneously in large and small doses and to compare the results obtained with the effect of similar doses on English cattle. The experimental data and post-mortem findings, together with charts illustrating the comparative progressive weight and the extent of the tuberculous lesions in the experimental animals, are submitted.

The experiments showed that at least 50 per cent of Indian buffalo or cow calves lived for many days after inoculation with 50 mg. of a bovine tubercle bacillus culture, and when killed exhibited only retrogressive or healing tubercular lesions. The results are indicated as confirming the general experience that Indian cattle are less commonly affected by tuberculosis than English cattle, and that " the comparative infrequency of the disease among cattle in India is due to a natural resistance rather than to any method of housing or keeping cattle in India as compared with England." A considerable variation in susceptibility was, however, observed in the Indian calves as compared with English calves. " Whether this variation be associated with differences in the breeds of the calves used by us has not yet been determined. It, however, follows that the comparative rarity of tuberculosis in Indian cattle must in part at least be attributed to diminished opportunities for acquiring infection."

The danger of the existence of tuberculosis in imported cattle and the necessity of attention to this point when attempting to develop a more useful milk-yielding stock is noted.

The experiments reported also show that, when using Indian breeds of cattle, the test for distinguishing between tubercle bacilli of the bovine and human types by using 50 mg. of a culture of the bovine type of bacillus can not be relied upon. In 50 per cent of the animals used the effects produced by such an inoculation did not materially differ from the effects produced by the injection of a similar dose of tubercle bacilli of the human type in English cattle.

The experiments also incidentally throw some light on the practical absence of tuberculous lesions caused by the bovine type of bacillus in children and

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adults in India. It is indicated that this material will be discussed in a subsequent publication.

Bovine tuberculosis, J. F. Devine (*Chicago: Amer. Vet. Pub. Co., 1917, pp. 120, figs. 7*).—This volume discusses the various phases of the disease. It contains an introductory article by E. Z. Russell, a discussion of the intradermal tuberculin test by D. F. Luckey, and an article on the State accredited herd by O. E. Dyson.

Advantages of testing pure-bred herds, S. H. Ward (*Jour. Amer. Vet. Med. Assoc., 52 (1917), No. 2, pp. 156–160*).—The author points out and briefly discusses the advantages of testing pure-bred herds.

The sterility of cows, its causes and treatment, J. Albrechtsen, trans. by H. Wehrbein (*Chicago: Alexander Eger, 1917, pp. 98 figs. 27*).—An English translation of the work previously noted (E. S. R., 24, p. 389). See also a recent note (E. S. R., 37, p. 379).

Facts disclosed in a study of the presence of Bacillus abortus in milk by means of the agglutination test, L. H. Cooledge (*Jour. Med. Research, 37 (1917), No. 2, pp. 207–214, figs. 2*).—The author here reports upon investigations at the Michigan Agricultural College conducted in continuation of those previously noted (E. S. R., 36, pp. 277, 383, 480).

Examinations made of the milk from 112 cows on 7 farms resulted in the finding of that from 24 cows on 5 farms to be infected with *B. abortus*. The percentage of infected udders in the 5 herds varied from 15 to 100 and was 27 per cent of the total. "The infection was present in a high percentage of the animals or was entirely absent, indicating the very infectious nature of the disease. Once the infection is established in the udder the milk becomes a carrier of *B. abortus* and a possible source of the infection for years. In no instance has the udder infection died out after being firmly established during the three years that observations have been made. The rear quarters are the first to show *B. abortus* infection, indicating that the genital discharges and switching of the tail are its source. The infection may then be carried to the front quarters upon the hands. The age of the cow apparently has no connection with the first appearance of the infection."

A list of 11 references to the literature is included.

Formalin treatment in mastitis, J. K. Bosshart (*Jour. Amer. Vet. Med. Assoc., 51 (1917), No. 6, p. 831*).—The author reports having obtained good results from the use of formalin in the treatment of mastitis in cattle as recommended by Frost (E. S. R., 37, p. 277). Half-ounce doses have, however, been found too toxic for some individuals, and he recommends as a safer dosage the use of 1 teaspoonful or about 0.2 oz. in 0.5 pint of raw linseed oil twice or three times daily, alternated with 1 oz. of turpentine in oil.

The cattle tick in Australia, J. D. Stewart et al. (*Advisory Council Sci. and Indus., Aust., Bul. 1 (1917), pp. 30, pls. 4*).—This is a report of a special committee appointed to review the status of the tick pest in Australia, present and future, and to make recommendations as to future research and immediate remedial or preventive measures, whether by legislation or otherwise.

The committee reports that there is no reason to believe that the cattle tick will not establish itself in congenial portions of the coastal areas in any part of Australia and Tasmania, and that unless its spread is checked it will be only a matter of time before all the States of the Commonwealth will become infested. At the present time the infestation is chiefly in Queensland and the Northern Territory, and to a less extent in Western Australia and New South Wales. As the matter is of national importance and vital to the prosperity of the Commonwealth, it is recommended that the Federal Government undertake the work of eradicating the pest. It is suggested that a start be made in the

east with the North Coast area in New South Wales and the adjacent portions of southern Queensland, and in the Helidon-Withcott area which adjoins the Darling Downs in Queensland. Other suitable areas are to be found in Queensland, the Northern Territory, and Western Australia from which a further selection might be made.

Hog cholera prevention and the serum treatment, P. T. PETERSEN (*California Sta. Circ. 176 (1917), pp. 15, figs. 5*).—A brief discussion of the subject.

Rinderpest in swine.—The first report of the Ako Antirinderpest Serum Institute, H. TAKASAWA (*Jour. Formosa Vet. Assoc., No. 1 (1916); abs. in Abs. Bact., 1 (1917), No. 4, pp. 313–315*).—During the 1911–12 epidemic of rinderpest 54.8 per cent of the animals which had not received protective inoculation were infected, whereas in the same locality where the plague was most severe only 7.98 per cent of the inoculated animals were infected.

Epizootics and their control during war, H. MIESSNER, trans. by A. A. LEIBOLD (*Chicago: Amer. Vet. Pub. Co., 1917, pp. 215, figs. 37*).—An English translation of the author's Kriegstierseuchen und ihre Bekämpfung, which is a guide for army, Government, and practicing veterinarians.

Part 1 (pp. 13–28) relates to horse hospitals and horse depots, blood examination stations, and disinfection. The diseases treated in part 2 (pp. 29–194) are glanders, anthrax, rabies, mange, contagious pleuropneumonia of horses (influenza pectoralis) catarrhal influenza, strangles, dourine, contagious pleuropneumonia of cattle, and rinderpest. Hints on handling war horses in America, by A. A. Leibold, are given in an appendix (pp. 197–207).

Kumri, combined diffuse sclerosis and central poliomyelitis of horses, G. H. K. MACALISTER (*Mem. Dept. Agr. India, Vet. Ser., 2 (1917), No. 8, pp. 203–261, pls. 6*).—"Kumri is a paraplegic disease of horses, associated with a diffuse sclerosis of the white matter of the spinal cord, affecting principally the propriospinal tracts and to a lesser extent the fibers of the lateral efferent and posterior efferent tracts. No causal microorganism has been isolated from cases of kumri. Filariasis and kumri are often coincident, but this is to be regarded as a chance conjunction and not as implying a causal relationship. This applies also to other types of helminthiasis.

"It is possible that kumri may be due to some type of vegetable poisoning or mold intoxication. In the present state of knowledge, this is no more than a speculation, which future research may establish or demolish.

"The disease occurs most commonly in low-lying districts subject to inundation, and is favored by warm moist climates. These conditions play some part in the production of kumri, either as a predisposing agency, or primarily as the direct causus morbificans. That it is the primary cause of the disease can only be established by the exclusion of all other possible causes. The condition is incurable but general treatment may possibly arrest the degenerative processes in those nerve elements, where these changes have not reached the stage of complete disorganization.

"Until the nature of the causal agent is known, no specific preventive measures can be suggested, but ordinary general hygienic precautions may be followed with advantage."

[Poultry sanitation], J. C. GRAHAM and H. D. GOODALE (*Massachusetts Sta. Rpt. 1916, pp. 87a, 88a*).—An experiment in the rearing of young poultry isolated on a plat half a mile from the poultry plant, where they were cared for by a man who had no other duties, resulted in an apparent freedom from disease and a remarkable freedom from the larger common parasites of poultry and in a low rate of mortality.

Tuberculosis of poultry in Ontario, D. H. Jones (*Ontario Dept. Agr. Bul. 255 (1917), pp. 8, figs. 6*).—This is a general discussion of the subject relative to cause, nature, symptoms, and control and eradication of the disease.

RURAL ENGINEERING.

Seepage and return waters, L. G. Carpenter (*Colorado Sta. Bul. 180 (1911), pts. 1, pp. 3–70, pls. 2; 2, pp. 3–45; 3, pp. 3–146*).—This bulletin, issued in 1916, consists of three parts, of which part 2 was published in separate form in 1911 (E. S. R., 28, p. 83).

Part 3 gives data of measurements and observations relative to seepage and return waters from irrigation for the Big Thompson River, Little Thompson Creek, St. Vrain Creek, Left Hand Creek, Boulder Creek, South Boulder Creek, Dry Creek, Clear Creek, Bear Creek, South Platte River, Arkansas River, the Rio Grande, Conejos River, and Uncompahgre River.

Part 1 summarizes the deductions from the observations in parts 2 and 3, and discusses the phenomena of seepage and the laws of flow of underground water as they apply to such conditions.

Report of Water Rights Branch of the Department of Lands for the year ended December 31, 1916, W. Young (*Rpt. Water Rights Branch Dept. Lands, Brit. Columbia, 1916, pp. 48, figs. 5*).—This report is of an administrative nature and contains data on irrigation, precipitation, and water conservation in the Province of British Columbia for the year ended December 31, 1916.

Calculations for design of irrigation structures, C. W. Helmick (*Transit [Univ. Iowa, 1917], June; abs. in Engin. and Contract., 48 (1917), No. 6, pp. 123, 124, figs. 3*).—Formulas of flow for use in calculating discharge through high gates of irrigation canals are given.

Farm drainage methods, W. W. Weir (*California Sta. Circ. 174 (1917), pp. 31, figs. 21*).—This circular was prepared under a cooperative agreement with the Office of Public Roads and Rural Engineering, U. S. Department of Agriculture. It is intended for use only in sections of California which are free from alkali and is not considered applicable to irrigated land.

"The purposes of this circular are to call attention to the need for drainage on many of the California farms which are located in regions where the annual rainfall is sufficient for agricultural purposes; to outline the advantages to be derived from drainage; to recommend the use of tile and the systematic construction of open drains; to offer suggestions regarding the spacing, depth, and size of drains, as well as methods and cost of installing them; and to urge better cooperation between the owners of adjoining farms in the disposal of storm water and surface run-off."

Drainage, B. H. Landels (*Nova Scotia Dept. Agr. Bul. 7 (1915), pp. 34, figs. 13*).—This is a brief discussion of the principles of land drainage and the construction of land drainage systems with reference to their application to Nova Scotia conditions.

The disinfection of drinking water, H. D. Dakin and E. K. Dunham (*Brit. Med. Jour., No. 2943 (1917), pp. 682–684; abs. in Jour. Soc. Chem. Indus., 36 (1917), No. 11, pp. 610, 611*).—Experiments with parasulphondichloraminobenzoic acid as a means for the effective sterilization of small drinking-water supplies, especially for field use, are reported. It was found to be more suitable than chloramin-T or toluensulphondichloramin.

A concentration of 1:300,000 was found sufficient to sterilize any ordinary heavily contaminated water in about 30 minutes. Such a concentration could be relied upon to remove coli, typhoid, or cholera organisms. Special experiments showed that the substance in tablet form was effective when acting on

water contained in aluminum bottles. "One point of advantage possessed by the present disinfectant over most hypochlorite preparations is the fact that the active chlorin is less rapidly used up, so that the process of disinfection continues for a longer period."

Information on the preparation, properties, and cost of the disinfectant are also given. "It is safe to say that the tablets could be sold at such a price that 100 gal. of water could be sterilized at a cost of one penny."

Experimental roads in the vicinity of Washington, D. C., B. A. ANDERTON and J. T. PAULS (*U. S. Dept. Agr., Office Sec. Circ. 77 (1917), pp. 8*).—This circular summarizes data on methods of construction, maintenance, and up-to-date cost records on experimental sections of surface treated macadam and gravel, bituminous macadam, bituminous concrete, cement concrete, and brick road in and near Washington, D. C. Traffic census data on most of the experimental sections are also given.

Massachusetts Highway Commission curve tables, compiled by A. M. LOVIS (*New York: John Wiley & Sons, Inc., 1917, pp. 47, figs. 2*).—Tables furnished by the Massachusetts Highway Commission for externals, radii, arcs for tangents of 100 ft., deflections for arcs of 100 ft., and skew distances for widths of 25 ft. are given.

Report of [Illinois] State Highway Commission, 1915–16 (*Ill. Highway Dept. Rpt., 1915–16, pp. 59, figs. 16*).—This is a review of the work of the Illinois State Highway Commission for 1915 and 1916.

General specifications for materials (*Ohio Highway Dept., Specifica., No. 3 (1915), pp. 77, figs. 9*).—General specifications for road-building materials issued by the Ohio Highway Department are given.

Material specifications (*Ohio Highway Dept., Specifica., No. 4 (1915), pp. 77, figs. 9*).—Specifications issued by the Ohio Highway Department for Portland cement, block, paving brick, stone and slag, gravel and sand, nonbituminous and bituminous binders and materials, timber, linseed oil and paint, steel and iron, and pipe are given. An appendix outlines methods of testing these materials.

The influence of total width on the effective width of reinforced concrete slabs subjected to central concentrated loading, A. T. GOLDBECK (*Proc. Amer. Concrete Inst., 13 (1917), pp. 78–88, figs. 13*).—Tests conducted by the Office of Public Roads and Rural Engineering of the U. S. Department of Agriculture are reported to show how the effective width of a reinforced concrete slab depends on the total width of the slab when it is supported at two ends only and is subjected to a central concentrated load.

It was found that "as the width of slab increases the ratio of effective width to span length shows considerable variation. This variation, however, is representative of what might be expected in actual structures, and apparently does not follow any law so far as thickness is concerned." The relation is expressed in the following table:

Relation of total width to effective width.

Total width.	Effective width.	Total width.	Effective width.	Total width.	Effective width.	Total width.	Effective width.
Span.	*Span.*	*Span.*	*Span.*	*Span.*	*Span*	*Span.*	*Span.*
0.1	0.10	0.6	0.50	1.1	0.67	1.6	0.72
.2	.20	.7	.55	1.2	.68	1.7	.72
.3	.28	.8	.58	1.3	.70	1.8	.72
.4	.37	.9	.62	1.4	.71	1.9	.72
.5	.44	1.0	.65	1.5	.72	2.0	.72

"The design of a slab of any width can be accomplished by using the formulas for narrow rectangular beams and substituting for the breadth (b) the value obtained from the above table."

The flow of concrete under sustained loads, E. B. Smith (*Proc. Amer. Concrete Inst., 13 (1917), pp. 99–102, figs. 2*).—Experiments conducted by the Office of Public Roads and Rural Engineering of the U. S. Department of Agriculture on the flow of concrete in cylinders and beams under load are reported.

It was found that "the law of the flow of concrete is asymptotic. The flow continues at a gradually decreasing rate and yet is an appreciable amount during three to four weeks. It then continues more slowly for an indefinite period, but this additional change is very small.

"The natural total shrinkage of dry concrete is about 0.05 per cent in three months. The total net flow under load, exclusive of natural shrinkage, may be as great as 0.15 per cent, depending upon the time, material, and load. The total combined effects of shrinkage and flow in compression may amount to as much as 0.2 per cent. This would give, in a 20-ft. column not reinforced, if loaded to about 800 lbs. per square inch, nearly 0.5 in. of deformation; and may produce, in a reinforced beam of 20-ft. span fully loaded, a sag of nearly 0.3 in. Even the much smaller deformations, which are inevitable, may produce, if not anticipated and provided for, serious results in the setting of apparatus and machinery, and in the alignment of shafting, and may easily cause other parts and members of the structure to be overloaded.

"The effect of flow within the material itself is either to relieve the stress condition, if the construction and loading make this possible, or to gradually change the length or position of the member.

"The maximum amount of flow or the flow for any particular period is almost directly proportional to the magnitude of the stress up to 1,000 lbs. per square inch. It is, therefore, only necessary to decide upon the allowable flow deformations in designs before determining the allowable dead- and live-load stresses.

"The measurement of stress conditions in concrete structures can not be made directly by deformation readings, unless all the flow constants as to time, material, and loading are known. . . . Deformation readings taken only a short time apart will indicate apparently different stress values.

"The magnitude of the flow deformations vary quite largely with the kind of aggregate and the mixture. . . . It is shown in these experiments that gravel concrete has about 20 per cent more deformation than limestone concrete.

"The modulus of elasticity of concrete is different for each mixture and for each different aggregate. It changes and decreases in value with time and as the flow deformations increase. If the modulus of elasticity could be ascertained for any particular concrete with due respect to the time factor, stress values could then be determined by simple deformation readings.

"In the case of a reinforced beam, the effect of flow in the concrete is to lower the position of the neutral axis, thus enlarging the compressive cross-sectional area and relieving the unit stress value. More stress is also thrown into the steel."

Friction tests of concrete on various sub-bases, A. T. Goldbeck (*Proc. Amer. Concrete Inst., 13 (1917), pp. 239–245, figs. 2; Good Roads, 51 (1917), No. 15, pp. 229–231, figs. 2*).—Further experiments (E. S. R., 37, p. 88) are reported in which the ground was muddy following a thaw. The results are given in the following table:

Frictional resistance of concrete on various sub-bases (sub-bases thoroughly saturated with water and surrounding ground exceedingly soft; weight of specimen, 870 lbs.).

Kind of base.	Movement.	Force.	Coefficient.	Movement.	Force.	Coefficient.	Movement.	Force.	Coefficient.	Movement.	Force.	Coefficient.
Level clay	0.001	120	0.14	0.01	300	0.35	0.05	500	0.58	1.500	950	1.09
Uneven clay	.001	200	.23	.01	460	.53	.05	620	.71	1.400	925	1.06
Loam	.001	150	.17	.01	260	.30	.05	410	.47	.750	925	1.06
Level sand	.001	140	.16	.01	280	.32	.05	400	.46	.750	875	1.00
¾-in. gravel	.001	510	.58	.01	640	.73	.05	950	1.10	.500	1,050	1.20
¾-in. broken stone	.001	400	.46	.01	660	.76	.05	940	1.08	2.000	1,160	1.33
3-in. broken stone	.001	240	.28	.01	630	.73	.05	900	1.04	.875	1,625	1.87
Oiled clay	.001	150	.17	.01	410	.47	.05	850	.98	1.250	1,425	1.64
Clay and cobble stones	.001	140	.16	.01	410	.47	.05	710	.82	1.750	1,260	1.45
Concrete base	.000	2,500+	2.9 +	.00	2,500+	2.9 +	.00	2,500+	2.9 +	.000	2,500+	2.9 +
Sand, oiled	.001	180	.21	.01	280	.32	.05	480	.55	.375	800	.92
Concrete, oiled	.000	2,500+	2.9 +	.00	2,500+	2.9 +	.00	2,500+	2.9 +	000	2,500+	2.9 +

These results, when compared with the previous results, "show very clearly that much depends upon the moisture condition of the sub-base. A wet sub-base permits the concrete to slide very much easier than does a dry sub-base. This apparently also applies to the specimens mounted on broken stone and gravel base, particularly when the movements are small.

"The formation of transverse cracks in concrete bases can readily be ascribed to direct tension due to frictional resistance at a time when the concrete is contracting, whether this is caused by decrease in temperature, or by drying out of the moisture. The test results show that the coefficient of friction can readily vary from almost 0 to something over 2 or more, depending upon the movement of the concrete and the character of the sub-base. The distance between transverse cracks is dependent upon the coefficient of friction, and the total force of friction must extend over this distance.

"Calling the coefficient of friction f, the distance between cracks D, the weight of the pavement per square foot w, we may write the equation:

$f \times w \times D$ = tensile strength of concrete per foot of width."

Farm concrete, K. J. T. Ekblaw (*New York: The Macmillan Co., 1917, pp. XI+295, pls. 16, figs. 71*).—This is a nontechnical treatise on the subject, consisting of the following chapters: Cement; concrete; foundations and walls; pavements, floors, sidewalks, steps; concrete building blocks; concrete fence posts; tanks, troughs, and cisterns; drain tile, culverts, and bridges; concrete silos; concrete surfaces and stucco; concrete in residences; and approximate cement tests, with an appendix giving standard specifications and tests for Portland cement.

Tests of fuel for agricultural steam engines (*Bul. Dir. Gén. Agr., Com. et Colon. Tunis, 20 (1916), No. 87, pp. 49–55; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 7, pp. 1012, 1013*).—Tests of seven kinds of wood and of lignite and coal briquettes in a 24-horsepower steam engine driving a hay baler working at a rate of 40 to 50 bales per hour are reported.

It was found that wood could be used for running the engine, two and a half to three times as much wood as coal being required. Slightly better results were obtained with dry wood than with green wood, and also with the larger sized branches than with the smaller ones. The resinous wood gave about medium results. Lignite gave about twice as good results as wood.

It is concluded that the use of wood or lignite in Tunis for this purpose will depend on the cost of obtaining them. The use of wood is considered an incentive to clear forest lands for agriculture, and the use of lignite should further its exploitation as a rich local natural asset.

The cost of using farm motors, I, II (*Country Life* [*London*], *41* (*1917*), *Nos. 1060, pp. 8*, 10*, fig. 1; 1061, pp. 8*, 10*, figs. 3*).—This article summarizes the experiences of a number of farmers and the estimates of a few manufacturers on the cost of operating different agricultural tractors on different soils, with special reference to English conditions.

Profitable tractor farming, E. J. STIRNIMAN (*Iowa Agr.*, *18* (*1917*), *No. 5, pp. 215–217, figs. 3*).—A tractor survey conducted in nine Iowa counties, namely, Marshall, Boone, Hamilton, Hardin, Story, Humboldt, Pocahontas, Calhoun, and Webster Counties, to which 171 tractor owners responded, is reported.

It was found that 91.2 per cent of the 171 tractors were considered paying, and 515 horses were displaced, or 0.8 horse per 100-acre farm area. The 8–16, 10–20, and 12–25, or small-size tractors, constituted 71.9 per cent of the total reported. Fifty-five and five-tenths per cent of the tractors were on farms of less than 281 acres, and 90 per cent of these were successful. It cost from 25 to 60 cts. per acre for fuel and oil, plowing at the rate of from 0.69 to 1.16 acres per hour. Thirty-nine per cent of the tractor owners were doing custom work and 89.8 per cent of these considered it profitable. Eight and one-tenth per cent of the farm help was displaced on 75 farms.

Large fireproof barn and silos built of concrete (*Concrete* [*Detroit, Mich.*], *10* (*1917*), *No. 5, pp. 175–177, figs. 8*).—This article describes and illustrates a large concrete barn with twin silos, built near Duluth, Minn. It is stated that the double concrete walls and concrete floors have produced a building which proves a satisfactory stable at a temperature of 40° below zero.

Small cold storages and dairy buildings, J. A. RUDDICK and J. BURGESS (*Canada Dept. Agr., Dairy and Cold Storage Branch Bul. 49* (*1917*), *pp. 21, figs. 5*).—This bulletin describes and illustrates plans for farm dairies, together with ice houses and refrigerators.

Fruit and vegetable storage structures (*Concrete* [*Detroit, Mich.*], *11* (*1917*), *No 2, pp. 37, 38, figs. 6*).—Simple concrete storage cellars for fruits and vegetables are described and illustrated.

RURAL ECONOMICS.

Human food from an acre of staple farm products, M. O. COOPER and W. J. SPILLMAN (*U. S. Dept. Agr., Farmers' Bul. 877* (*1917*), *pp. 11*).—This publication is designed to give an acre for acre comparison of the protein and energy value of different crops and animal products. The production of live stock products per acre was arrived at by assuming the acre to be planted in suitable food for live stock, in proper proportion to give a balanced ration.

According to the computations, corn furnishes the most calories per acre, the number being estimated at over 3,000,000. The next highest crop for energy production is sweet potatoes, furnishing 2,800,000 calories. Other products in their order of importance from this standpoint are Irish potatoes, rye, wheat, rice, soy beans, peanuts, oats, beans, cowpeas, and buckwheat. The number of calories obtained from an acre in the production of milk was approximately 700,000. The product next in importance among animal products was pork, with approximately 675,000 calories.

The largest estimated yields of protein per acre are from soy beans, beans, and corn.

Details regarding the method of making the computation and the results obtained for the various items are included.

The food supply of the German Empire (*Rpt. Physiol. (War) Committee Roy. Soc. [London], 1 (1915), pp. 6, figs. 2; 2 (1916), pp. 9*).—These reports discuss the food supply of Germany available during the first two years of the war and point out the changes in its composition.

The two agricultures, G. SAUVAGE (*Paris: Author, 1916, pp. 11+244*).—In this book is given a general review of agriculture in Germany and France and a discussion of different types of agricultural instruction found, the use of agricultural machinery and motors, methods used in destroying injurious insects, and establishing new agricultural industries and enterprises.

Report of the national Scottish conference on employment on the land, 1916 (*Rpt. Nat. Scot. Conf. Employment on Land, 1916, pp. 104, pls. 3*).—Among the subjects discussed in this conference were the employment of women and of discharged soldiers and sailors on the land, methods of development and extension of small holdings, cooperation in farming, conditions of successful land settlement, and afforestation after the war.

Report on the private insurance organizations in Switzerland for 1915 (*Rap. Bur. Suisse Assur., Entrep. Priv. Nat. Assur., 30, (1915), pp. 201*).—In this report are discussed the private insurance organizations for accidents, fire, hail, live stock, loss in transit, damage from weather, and damage to glass. Statistical data are also given showing the extent of the organizations and the amount of business done.

Cooperation in Wisconsin, B. H. HIBBARD and A. HOBSON (*Wisconsin Sta. Bul. 282 (1917), pp. 44, figs. 13*).—Among the types of cooperative organizations described are those connected with creameries, produce and feed, cheese, live stock, merchandise, fruit, telephones, and laundries. The authors give information regarding the extent of the various organizations and their development and the reasons for their successes and failures, and point out that their business now amounts to over $62,000,000 per annum. Of the 83 creameries in the State 45 per cent are cooperative; of the cheese factories, 37 per cent. Among the various types of associations looking toward improvement of the live-stock industries are live-stock shipping associations, community breeders' associations, and cow-testing associations.

It is pointed out that the professional promotion of associations by outside parties is to be deplored and discouraged.

Public markets in the United States, C. L. KING ET AL. (*Philadelphia: Nat. Munic. League, 1917, pp. 32*).—This is the second report of the committee on public markets of the National Municipal League, and includes information concerning public markets investments, annual receipts and expenditures, rental of stalls, inducements to farmers, attendance, price to consumers, sanitary conditions, and consumers' views of the markets.

Third annual report of the department of foods and markets, 1916 (*Ann. Rpt. Dept. Foods and Markets, N. Y., 3 (1916), pp. 26*).—This report continues the information previously noted (E. S. R., 36, p. 392), and adds data regarding the investigation of methods of marketing foods, vegetables, poultry, and milk, and methods used in securing an advance in prices paid to producers of milk.

Second annual report of the director of farm markets for the State of Idaho, W. G. SCHLOTZ (*Ann. Rpt. Dir. Farm Markets, Idaho, 2 (1916), pp. 27*).—Among the activities of the director of markets in Idaho were the establishing of a market news service, holding of State-wide conventions of farmers, developing of public markets and dairy and fruit industries, and assisting in land settlement. There was also established an employment bureau for farm help.

[Farm market laws] (*Boise, Idaho: State Dept. Farm Markets, 1917, pp. 16*).—In this document are contained the text of the laws governing the Department of Farm Markets as passed by the Idaho legislature in 1917.

Arkansas warehouse, marketing, and gin regulating law (*Little Rock, Ark.: State Bd. Supervisors of Warehouses, 1917, pp. 95*).—This report contains the text of the law enacted in 1917, together with standard forms to be used in connection with the law.

Canadian Produce Association (*Canad. Prod. Assoc. Conv., 5 (1917), pp. [36]*).—Among the topics discussed at this convention, held in Montreal, were the loss-off system of buying eggs and quality payment, action of the Government through legislation regarding buying and selling of bad eggs, a system of weighing and inspecting butter, exportation of eggs to Great Britain, proposed standards for live and dressed poultry, and the organization of produce exchanged in Winnipeg and Montreal.

[Grain trade in the United States] (*Conf. Represents, Grain Trade 1917, Aug. 15, pp. 57*).—This report gives the proceedings of the Conference of Representatives of the Grain Trade of the United States, held in Washington, D. C., August 15, 1917, in regard to the formation of the U. S. Grain Corporation, its functions, and its methods of procedure.

Problems, prices, and profits of the packing industry (*Chicago: The Cudahy Packing Co., 1917, pp. 30, pl. 1*).—This report contains a reply to the Federal Trade Commission as to the causes of the present high prices, whether methods of distribution of meat and meat products are the most efficient possible, whether present methods interfere with the natural economic laws, and what remedies may be applied to overcome any weakness in the present system. The report sets forth in a general way the situation regarding the great packing house industries, and the profits derived from the present methods of distribution.

Report on the production of creameries and cheese factories, 1915 and 1916, E. H. Godfrey (*Canad. Census and Statis. Off., Rpt. Prod. Cream. and Cheese Fact., 1915–16 [English Ed.], pp. 16*).—This report gives statistical data showing by Provinces the number of different kinds of butter and cheese factories, the number of patrons, quantity of milk used, butter and cheese made, prices received for all dairy products, and foreign trade of Canada in dairy products.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt., 3 (1917), No. 10, pp. 93–104, fig. 1*).—This report contains the usual estimates of crop conditions, estimated farm value of important farm products, average prices received by producers, and range of prices of agricultural products at important markets, and also contains a special crop summary for October, special reports regarding the condition of crops in California and Florida and of pecans, and data with reference to the acreage of peanuts and fall onions, the production of hops, Kafir and broom corn, soy beans, and cabbage, the estimated wheat surplus and deficiency, by States, frost damage to corn, the percentage of hay baled, the increase in acreage of peas and beans for feed and food, etc.

[Florida State census of 1915] (*Bien. Rpt. Dept. Agr. Fla., 14 (1915–16), pt. 2, pp. 237–357*).—In this census data were gathered regarding the white and negro population; acreage, yield, and value of principal farm crops; number of live stock and number of thoroughbred stock; and the quantity of agricultural products sold. The data are shown by counties.

[Agriculture of Minnesota] (In *Minnesota's Fifty-second Anniversary, St. Paul: State Bd. Immigr., [1917], 10. ed., pp. 2–51, 72–200, figs. 71*).—The State Board of Immigration points out in this publication the resources by counties,

showing the area, types of soil, acreage in various crops, educational and religious facilities, banking conditions, and value of farm lands.

Agricultural statistics of Ireland (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis. 1915, pp. 110*).—This report is a continuation of previous reports (E. S. R., 36, pp. 393), adding data for the year 1915.

[Agriculture in Norway] (*Statis. Aarbok Konger. Norge, 35* (*1915*), *pp. 23–36*).—These pages continue data previously noted (E. S. R., 33, p. 594) by adding statistics for the year 1915.

[Agricultural statistics of Russia for 1915] (*Sborn. Statis. Zkon. Svi͡edi͡en. Selsk. Khoz. Ross. i Inostran. Gosud.* (*Rec. Données Statis. et Écon. Indus. Agr. Russ. et Pays. Étrangers*), *10* (*1917*), *pp. XIV+673*).—This report continues data previously noted (E. S. R., 36, p. 594), adding information for 1915.

[Annual statistics of Egypt] (*Ann. Statis. Egypte, 8* (*1916*), *pp. 104–153, pl. 1*).—This report continues data previously noted (E. S. R., 35, p. 894), giving statistics for later years.

AGRICULTURAL EDUCATION.

Report of the education branch for the year 1915–16 (*Jour. Bd. Agr. [London], 24* (*1917*), *No. 4, pp. 385–394*).—This is the annual report of the Board of Agriculture and Fisheries dealing with the agricultural education work of the various institutions and local authorities in England and Wales for 1915–16, as well as with the payments of grants during the financial year ended March 31, 1916.

During the year it was decided as a measure of war economy to suspend the grants to the Harris Institute, Preston, and to the Royal Horticultural Society's School at Wisley. The Royal Agricultural College, Cirencester, and the Agricultural College, Uckfield, Sussex, were closed in the summer of 1915, owing mainly to the serious decrease in attendance. All of the institutions have suffered as a result of the war. Their attendance in 1914–15 was as follows: Long courses, 758, short courses, 666, as compared with 1,194 and 490, respectively, in 1913–14, and 1,284 and 593 in 1912–13. The new buildings at the Armstrong College, Newcastle, have been wholly utilized as a hospital since the beginning of the war, and rooms in the School of Agriculture, Cambridge, and in Wye College, were occupied for a time for military purposes. The Royal Veterinary College, London, is the only institution whose activities have not seriously diminished.

Local authorities held 292 organized day courses in 1915–16, attended by 2,963 students, as compared with 341 courses with an attendance of 3,544 in the previous year. The greater part of these courses were attended by women and were held in connection with traveling dairy schools. In several counties courses in farriery were held for soldiers. One hundred and seventy-one evening courses were held, attended by 3,227 pupils, as compared with 297 courses attended by 4,975 pupils in 1914–15. Classes in manual processes (hedging, plowing, milking, etc.) were held in 12 counties, the total number of meetings being 644; in the previous year 2,071 meetings were held in 21 counties.

To encourage cheese making instead of butter making, with a view both of conserving the food supply and the economical utilization of surplus milk, the board developed a scheme of establishing traveling cheese schools, under which it loaned sets of apparatus to local authorities who agreed to make new and additional provision for itinerant instruction in this subject. Nineteen authorities availed themselves of this offer, and 33 new schools were created in addition to 5 previously in existence.

The total amount distributed by the board for agricultural education for 1915–16 was $479,420 (including $322,776.90 from the Development Fund), as compared with $469,612 in 1914–15 and $139,433 in 1911–12. The grants for 1915–16 included $78,343 for universities and colleges, $32,479 for advisory work, $106,706 for research institutions and centers, $30,963 for special research investigations, $8,729 for research scholarships, $135,633 for farm schools, technical classes, local lectures, etc., $66,067 for the establishment of farm schools, $5,638 toward the expenses of advisory councils, and $14,862 for forestry advice, research, and experiments.

Eighth annual report of the eleven district agricultural schools of Georgia, J. S. Stewart (*Bul. Ga. State Col. Agr., No. 138* (*1917*), *pp. 28, fig. 1*).—This is a report on the annual meeting of the principals and on the work of the 11 district agricultural schools of Georgia for the year 1916–17, including extension work, teacher training courses and summer institutes, special features, an outline of the 4-year courses in agriculture and home economics, and statistical data with reference to enrollment, land and equipment, and disposition of funds.

The total enrollment of the 11 schools was 1,622, ranging from 72 to 210 students. The schools cultivated a total of 1,094 acres, varying from 80 to 150 acres a school. The total value of their live stock was $27,022, and of tools $17,185.

It was agreed by the principals that the status of the schools be defined as that of 4-year high schools so articulated to the Georgia State College of Agriculture as to provide admission thereto on the basis of 14 Carnegie units, and further that 36 hours of technical work per month be required of each student without remuneration. It was suggested that the laboratory work required by the various schools be unified, and that as a general rule not less than seven periods per week (three recitations and two double laboratory hours) should be given to each science.

Agricultural education and experimentation in the Republic of Argentina, T. Amadeo (*Min. Agr. [Argentina], Div. Enseñanza Agr. [Pub.], No. 61* (*1916*), *pp. 208, figs. 70*).—This report deals with the history, development, and present status of agricultural instruction in Argentina, the agricultural education budget and inventory, a proposed central institute of agricultural investigation, the agricultural education law, and the duties of public authorities with reference to agricultural education. Appendixes contain statistics of the agricultural education and investigation institutions with reference to the value of land, buildings, and equipment, and discussions of the cost of agricultural education institutions, a central institute of agricultural investigation, agricultural instruction in the normal and primary schools, and agricultural instruction for women in universities and special schools for men.

Report on agricultural and forestry education in the Dutch East Indies, H. C. H. De Bie, W. G. Boorsma, A. de Koning, and L. de Blieck (*Jaarb. Dept. Landb., Nijv. en Handel Nederland. Indië, 1915, pp. 93–124, 155–164, 292–313*).—This annual report on the activities of the Department of Agriculture, Industries, and Commerce of the Dutch East Indies, includes a report on the progress of agricultural research and instruction in 1915. The latter comprises instruction given in the Higher Agricultural School at Buitenzorg, a secondary school of cultivation at Soekaboemi, a veterinary school at Buitenzorg, 17 elementary agricultural schools for the natives, normal schools, special courses of lectures, demonstrations, etc., for adults, and an experiment in giving instruction in agriculture to the higher classes of village public schools.

The study of veterinary science, M. Cumming, F. T. Daubigny, J. H. Reed, C. D. McGilvray, W. J. Rutherford, and H. A. Craig (*Agr. Gaz. Canada, 4* (*1917*), *No. 10, pp. 874–881*).—A brief description is presented of the instruc-

tion in veterinary science given in Nova Scotia by the College of Agriculture; in Quebec by the School of Comparative Medicine and Veterinary Science, affiliated with Laval University; in Ontario by the Ontario Veterinary College, and the veterinary department of Ontario Agricultural College, in Manitoba by the Manitoba Agricultural College; in Saskatchewan by the College of Agriculture of the University of Saskatchewan; and in Alberta by the schools of agriculture at Olds, Claresholm, and Vermilion.

Productive farming, K. C. DAVIS (*Philadelphia and London: J. B. Lippincott Co., 1917, 3. ed., rev. and enl., pp. VIII+427, pl. 1, figs. 244*).—This is a third revised and enlarged edition of this text, previously noted (E. S. R., 28, p. 393). The principal additions include chapters on tobacco for market and road construction and mechanics, and suggestions to teachers for additional exercises and projects. There are also minor additions throughout the text and the data in the appendixes are brought up to date.

Summer courses in agriculture for teachers, D. A. DEWOLF, R. P. STEEVES, F. C. HARRISON, J. B. DANDENO, R. FLETCHER, A. W. COCKS, J. C. MILLER, and J. W. GIBSON (*Agr. Gaz. Canada, 4 (1917), No. 10, pp. 887–900, figs. 7*).—Reports are given with reference to attendance, organization, and subjects and length of courses in agriculture for teachers in 1917 summer schools in Nova Scotia, New Brunswick, Macdonald College, Ontario Agricultural College, Manitoba, Saskatchewan, Alberta, and British Columbia.

School and home gardening, J. L. RANDALL (*Rpt. Comr. Ed. [U. S.], 1915–16, I, pp. 259–270*).—In this review the author discusses the need for gardening, the early history and present status of children's gardens, garden promotion by agencies other than schools, gardening in several recent city school surveys, the plan of gardening suggested by the school and home gardening division of the U. S. Bureau of Education, and children's gardens in Porto Rico and the Philippine Islands. A brief statement with reference to the care of school gardens during the summer vacation in Canada, by C. H. Lane, is included.

Instruction in gardening in cooperation with the International Children's School Farm League (*Jour. N. Y. Bot. Gard., 18 (1917), No. 207, pp. 53–61, pl. 1*).—An account is given of a plan of cooperation which became effective April 1, 1917, between the International Children's School Farm League and the New York Botanical Garden for the establishment at the garden of a training school for teachers of children's gardens and others interested in gardening. The managers of the garden, in consideration of a guaranty of $4,400 a year for a term of not less than two years, agree to set apart and prepare a tract of land and to furnish lecture-room accommodations, library and herbarium facilities, etc., for the purpose.

The gardening courses to be offered are outlined.

Gardening for little girls, OLIVE H. FOSTER (*New York: Duffield & Co., 1917, pp. [16]+144, pls. 8, figs. 4*).—Directions are given for planning and planting flower gardens, together with information with reference to colors, season of bloom, etc., of the more common annuals and perennials.

Boys' and girls' club contests, J. E. MCLARTY ET AL. (*Agr. Gaz. Canada, 4 (1917), No. 6, pp. 476–483*).—Brief accounts are given of the present status of boys' and girls' club contests in the Provinces of Prince Edward Island, Nova Scotia, Quebec, Manitoba, Saskatchewan, Alberta, and British Columbia.

MISCELLANEOUS.

Fortieth Annual Report of Connecticut State Station, 1916 (*Connecticut State Sta. Rpt. 1916, pt. 6, pp. XXII*).—This contains the organization list, a report of the board of control, and a financial statement for the fiscal year ended September 30, 1916.

Twenty-ninth Annual Report of Massachusetts Station, 1916 (*Massachusetts Sta. Rpt. 1916, pts. 1–2, pp. X+92a+319, figs. 150*).—This contains the organization list, reports of the director and heads of departments, a financial statement for the fiscal year ended June 30, 1916, and reprints of Bulletins 168–172, previously noted. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Thirtieth Annual Report of Nebraska Station, 1916 (*Nebraska Sta. Rpt. 1916, pp. LIII*).—This contains the organization list, a report as to the work of the year, a report of the extension service of the college of agriculture, and a financial statement for the period ended June 30, 1916. The experimental work reported is for the most part abstracted elsewhere in this issue.

Miscellaneous experiments (*Pennsylvania Sta. Bul. 147 (1917), pp. 40, figs. 21*).—This bulletin contains a number of short articles, the experimental features of which are for the most part abstracted elsewhere in this issue.

Monthly Bulletin of the Ohio Experiment Station (*Mo. Bul. Ohio Sta., 11 (1917), No. 10, pp. 315–349, figs. 11*).—This contains several articles abstracted elsewhere in this issue; Acid Soils and Soil Acidity, by C. J. Schollenberger; and notes.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta. Mo. Bul., 5 (1917), Nos. 7, pp. 93–108, figs. 2; 8, pp. 109–124, figs. 7*).—These numbers contain brief articles on the following subjects:

No. 7.—The Farmer's Opportunity, by H. L. Blanchard; Good Fall Farming Practice in Western Washington, by E. B. Stookey; Pure-bred Sires Pay, by N. C. Jamison; Fruit, A Food Essential, by R. J. Barnett; The Home Fruit Garden, by J. L. Stahl; Standardizing Eggs, by Mr. and Mrs. G. R. Shoup, including a description of a homemade egg-grading device; How About Your Drinking Water? by C. A. Magoon; and Home-grown Kale Seed, by E. B. Stookey.

No. 8.—Safe and Sane Methods of Increasing Food Production, by G. Severance; Farmyard Manure—Our Best Fertilizer, by E. B. Stookey; Handling Poultry Manure, by Mr. and Mrs. G. R. Shoup, including a description of a homemade poultry manure cart; The Farm Flock, by C. E. Howell; Currants and Gooseberries in Western Washington, by J. L. Stahl; Why Do Trees Fail to Fruit? by J. L. Stahl; Storage Rots of Potatoes, by A. Frank; and Four Common Plant Diseases, by A. Frank.

NOTES.

Arizona University and Station.—Dr. R. H. Forbes, dean of the college of agriculture and director of the station, has been given a year's leave of absence to assist the Société Sultanienne d'Agriculture, of Cairo, Egypt, in agricultural war service in the valley of the Nile. Charles R. Adamson has resigned as poultryman to become a county agent.

Kansas College and Station.—Dean W. M. Jardine has been appointed president, and Dr. J. T. Willard, vice president. Harry L. Kent, associate professor of education and principal of the school of agriculture, has been appointed State director of education under the Federal Vocational Education Aid Act. R. W. Kiser, instructor in animal husbandry and superintendent of land and live stock, has become extension animal husbandman and has been succeeded by J. W. Crumbaker, foreman of the agronomy farm, and he in turn by Geo. H. Phinney. N. E. Olson has resigned as assistant in dairying and has been succeeded by W. R. Davis. H. A. Pratt has been appointed assistant in horticulture and foreman of the greenhouse, vice W. F. Pickett resigned.

Maine Station.—Dr. Raymond Pearl, biologist and for some time in charge of statistical work for the U. S. Food Administration, has been appointed head of the department of biometry and vital statistics in the school of hygiene and public health of John Hopkins University.

Nevada University and Station.—Dr. Winfred B. Mack, head of the department of veterinary science and bacteriology in the university and station since 1907 and head of the State Veterinary Control Service, died January 18 at the age of 46 years. Dr. Mack was a 1904 graduate of the New York State Veterinary College with two years post graduate training, and in 1905–6 was assistant in comparative pathology and bacteriology at Cornell University. His work in Nevada had dealt mainly with diseases of live stock, notably infectious anemia of horses, contagious epithelioma of chickens, and various disorders of sheep and cattle. Of late he had been giving particular attention to quarantine and inspection work, including the supervision of the campaign against rabies.

New Mexico Station.—C. A. Thompson, assistant in soils in the Washington Station, has been appointed assistant agronomist, vice A. Z. Smith, who has taken up county agent work.

New York State Station.—F. H. Hall, vice director and editor, has been granted leave of absence to take charge of publicity work of the U. S. Food Administration dealing with perishable foods.

Wisconsin University and Station.—Dean H. L. Russell has been granted leave of absence to succeed George E. Haskell in charge of the work with butter and cheese of the United States Food Administration.

Progress in Agricultural and Home Economics Instruction in Canada.—The chief of the Military Convalescent Home of Sans-Bruit, Quebec, has made arrangements for teaching agriculture to convalescent soldiers, the courses being in charge of a district agricultural representative. Instruction has been given in practical work in drainage surveys and rotations on the hospital farm, commercial poultry keeping, market gardening, and beekeeping. Some of the

convalescents have also helped in field husbandry, soil preparation, harvesting, etc.

What are known as the royal agricultural schools, incorporated by the legislature of Quebec, are designed to give instruction to the sons of soldiers. These schools and farms are situated in the township of Howard, Argenteuil County, and are open to the sons of all soldiers who have taken part in the war. The property of the schools consists of 3,468 acres, with a large residential building to accommodate 25 boys, a residence for teachers, and a number of cottages for workmen. The parents of the boys will be under no expense for their sons while they are at the schools, and when of sufficient age the boys will be assisted in making a start for themselves.

A two-year agricultural course was opened at the Victoria (B. C.) high school last fall with 30 boys and girls in attendance. It has been substituted for one or both of the two foreign languages previously required, except that students wishing to qualify for first-class teachers' certificates or for entrance to the university must include with agriculture the study of one foreign language. All of the usual branches of agriculture are covered, and with some slight variation in the second year, when home economics for girls and certain special topics in agriculture for boys are emphasized, are the same for boys and girls.

Farm Schools in the Philippines.—Beginning with the present school year, 1917–18, all schools where a course in farming is given are to be in session throughout the year. This is not entirely a new venture, as for several years all settlement farm schools and most agricultural schools have been in continuous session, and notwithstanding the younger pupils enrolled in them these schools have maintained the best farms.

The calendar year has been divided into 42 weeks of classroom work, 4 weeks of special field practice, 4 weeks of vacation, and 1 week each for examinations and an annual cleaning up. Each pupil enrolled will be given a vacation of 4 weeks at the time in the year that the farm activities can best spare his services. All teachers assigned to farm schools are required to render service throughout the school year, except that short vacations may be given when their services can be spared.

It is believed that students should be detailed to definite projects and thereby become factors in a productive enterprise. Each pupil is expected to do field work for not less than 4 consecutive periods (160 minutes) each day for 5 days a week, and daily field work up to 3.5 hours may be required at the option of the principal. Each pupil is required to perform at least 3 hours of field work on every other Saturday forenoon.

The same school year and calendar hold for the domestic science classes in farm schools. For the required four weeks of all-day work the principals may select one or more of the following activities for the girls: Canning and cooking, the preparation and serving of midday meals to the boys on all-day work detail, commercial lace or embroidery making, or sewing on their own clothes or clothing for members of their families. The services of the girls are also employed during the harvest periods in assisting with certain kinds of field work.

Agricultural Instruction for Orphans of Farmers Killed in the War in Italy.—Francesco Borgogna has instituted in the Home for the Poor in Vercelli, 12 places for orphans of farmers who have fallen in battle. This provision will give them an opportunity to complete the elementary course and the secondary courses in the professional school of agriculture in the Borgogna Royal Professional School, leading to the diploma of special field agent in rice culture.

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The Agricultural Experiment Stations of the United States.

U. S. DEPARTMENT OF AGRICULTURE
STATES RELATIONS SERVICE
A. C. TRUE, DIRECTOR

Vol. 38 MARCH, 1918 No. 4

EXPERIMENT STATION RECORD

WASHINGTON
GOVERNMENT PRINTING OFFICE
1918

U. S. DEPARTMENT OF AGRICULTURE.

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Oregon—*Corvallis:* A. B. Cordley.[1]
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State College: Institute of Animal Nutrition, H. P. Armsby.[1]
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[1] Director. [2] Agronomist in charge. [3] Animal husbandman in charge. [4] Acting director.

EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Chief, Office of Experiment Stations.*
Associate Editor: H. L. Knight.

EDITORIAL DEPARTMENTS.

Agricultural Chemistry and Agrotechny—E. H. Nollau.
Meteorology, Soils, and Fertilizers {W. H. Beal. J. D. Luckett.
Agricultural Botany, Bacteriology, and Plant Pathology {W. H. Evans, Ph. D. W. E. Boyd.
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MAY 1 1918

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AGRICULTURAL BOTANY.

FIELD CROPS.

HORTICULTURE.

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ANIMAL PRODUCTION.

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U. S. Department of Agriculture—Con.

[1] Printed in specific and technical publications outside the Department.

EXPERIMENT STATION RECORD.

Vol. 38. March, 1918. No. 4.

Although more than half a century has now elapsed since the passage of the first Morrill Act, the question is still occasionally agitated of the purpose and optimum development of the institutions established under its provisions. Criticism sometimes takes the form of assertion that the act itself is vague and prescribes no definite type of education. More frequently it is argued that a kind of high-grade vocational training was contemplated by the act, but that the agricultural colleges or individual institutions of the group are not fulfilling their appointed mission in that direction. In still other instances the relations of these colleges to other educational institutions or to the State system of education, the efficiency of their administration, or the formulation of a broad constructive policy for their future development have been the subjects of inquiry from various points of view.

The report of a special commission which has been studying some of these matters in Massachusetts has recently been issued, and appears to be of considerable general interest. This commission was authorized by the Massachusetts Legislature in 1916 for the purpose of investigating " the subject of agricultural education as conducted at the Massachusetts Agricultural College and the development of the agricultural resources of the Commonwealth." For some time there had been, in connection with the granting of appropriations to the college, more or less agitation as to the type of instruction it should give, its policies, and similar matters. While specific lines of inquiry were prescribed to the commission which had special reference to local conditions, most of the questions raised are common to the agricultural colleges as a group, and many of the findings of the commission are of much more than State-wide application.

The commission consisted of the State supervisor of administration and the State commissioner of education, together with three members designated by the governor. One of these, Dr. L. Clark Seelye, president emeritus of Smith College and widely known in educational circles throughout the country, was made chairman. The remaining members were selected respectively from the agricultural and business interests.

Public hearings were held in several sections of the State, as well as conferences with representatives of various agricultural organizations, educational institutions, and similar bodies. A detailed inspection was made of the work of the college and a comparison of its management with that of other institutions. A committee attended the 1916 session of the Association of American Agricultural Colleges and Experiment Stations, and had interviews with many of the presidents and deans present and with officials of this Department, the U. S. Bureau of Education, and others. In short, the intention was to seek information from all available sources, and to make a thoroughgoing study from which could be formulated, with some degree of finality, conclusions as to the future policy of the State toward the college.

The commission gave special consideration to a determination of what should be the fundamental purposes and relative educational status of an agricultural college. It concludes that "the land-grant colleges were primarily established to promote the study of agriculture by the most advanced and scientific methods of instruction." Consequently, "the courses of instruction in the college should indicate an institution of a high grade for the teaching of scientific agriculture. In its distinctive field of agriculture it should be comparable with the Massachusetts Institute of Technology in its field of mechanic arts. No countenance whatever should be given to any suggestions that the agricultural college should be placed on the level of a trade or vocational school."

This attitude is specially gratifying because the contention of those primarily responsible for instigating the inquiry was that the college courses were too technical, and that the institution should be in effect a farm school. Similar views have been expressed in other quarters, and it is hoped that the conclusions of this commission may help to terminate controversy along this line.

The commission gives little credence to the conception occasionally met with that agricultural education is somehow inferior in its pedagogical requirements and value to other types of education. The policy early established and consistently maintained by the Massachusetts College of insisting on adequate preparation and high standards of instruction and scholarship is thoroughly approved. The commission declares that the standards of entrance "should be high enough to secure students capable of maintaining a high grade both in academic and scientific study. Without admitting that these entrance requirements should be the same as those adopted by the colleges of liberal arts, yet the commission believes that they should be of as high a standard. . . . The commission indorses fully the position of the college in requiring that its students shall be as well prepared for its

instruction as students are for advanced instruction in any other institution of higher education, and that the degrees it confers shall be of equal worth in their field with the academic degrees conferred by other colleges as certificates of attainment in other fields."

The relations of the college to the secondary schools of the State are also discussed. The agricultural college is regarded as "the last stage in a State-wide educational system for the advancement of agricultural science," and for this reason should be closely correlated with secondary schools where agriculture is taught. It is recognized that in such schools, and particularly those functioning under the Federal Aid Vocational Education Act, the primary aim is quite distinct from that of college preparation, and that agriculture will be taught there from a very different point of view. Nevertheless, the commission advocates the establishment of optional agricultural courses, so far as practicable, in public high schools, and where this is done, the granting by the college of the same credits as would be given in any other science. It is made plain, however, that other courses properly included in the high school curriculum should not be supplanted, but "should be so arranged as to make it possible for the student to secure a thorough and comprehensive training which will enable him to enter the agricultural college in good standing and at least with an elementary knowledge of the subject on which his future work will naturally be based."

With reference to the charge that the college has been offering too general an education, the commission reports that substantially three-fourths of the students are giving three-fourths of their time to distinctively agricultural subjects. It finds that science occupies by far the most prominent position in the curriculum, with fifty-four members of the faculty engaged in instruction in agriculture and the cognate sciences and only fourteen in the humanities and mathematics. So far from the existence of any trend away from agricultural work, it was brought out that there is rather a prevailing tendency among the undergraduates to "elect studies according to their supposed commercial values and to neglect those studies which aim to strengthen and cultivate the mind." The commission does not specifically condemn this tendency, but it points out that, "while the State in its acceptance of the provisions of the Morrill Act is bound to give special instruction in agriculture, it is not less bound by the language of the act to give a liberal education as an integral part of its distinctive work, and not to neglect or relegate to subordinate places those studies which experience has shown are best fitted to nourish and strengthen the faculties of the mind and which will enable men to do better work, whatever that work may be."

The familiar criticism that only a small proportion of the graduates become farmers, because of a lack of practical instruction, is

deemed entirely unmerited. It is shown that farm work is now required of every student and that a summer session has been introduced whereby such work can be carried on more readily. Of the total hours assigned to work in the divisions of agriculture and horticulture over two-thirds are given to laboratory and field work. Though the commission sees no necessity for imposing any arbitrary requirement of farm experience upon faculty members, a great majority of the instructing force in these departments have had such experience. "The lack of practical farmers, therefore, among the graduates does not appear to be due to a lack of practical work in agricultural instruction and can be more readily explained from other causes.

"Practical farmers the college does educate. They are found in all parts of the State, and they are conducting farms which are profitable to themselves and are profitable as object lessons. The important consideration, however, is that the college should train men who by their superior education and intelligence can make valuable contributions to the agricultural interests of the Commonwealth." The showing made by the college in this respect is commended as highly creditable.

The commission was apparently little impressed with the somewhat provincial complaint presented that many graduates from the Massachusetts College settled outside the State, which thereby lost the benefits of their work. It points out how largely the State college is indebted to the Federal Government for its support, so that "if its graduates enter into the service of other States it is only repaying the Federal Government for the aid it has received. All of the States are mutually indebted to each other for scientific knowledge, and it should be a source of congratulation rather than of complaint that the agricultural college here can pay to the other States something of its indebtedness to them." While the first and constant care of the college is the promotion of the welfare of agriculture in Massachusetts, there should be "the closest affiliation between the Federal and State agencies for the advancement of common interests, and every State college should work not only for the interests of its own State, but also for the promotion of agriculture throughout the United States."

The commission went quite fully into the administration and operation of the exepriment station, having before it some criticisms as to the technical character of its work and publications, alleged delay in meeting popular requests for assistance in combating insect pests and plant diseases, and laxity in enforcing State control laws. The intelligent and broad-minded manner in which these matters are handled in the report speaks for the study given them and the generally creditable condition found to prevail in the station.

The work of the station is referred to as "one of the most important departments of the college," and one which has "richly contributed to the agricultural wealth of the State." Some suggestions are put forward as to the means of strengthening its research activities, among others relieving it entirely of the administration of control laws and providing for practically full-time service of its staff on experimental work.

The commission takes an enlightened view of the conditions and requirements of station work. It maintains that "the main work of the station should be carried on by highly trained experts who give practically all of their time to research. It will be conceded that research work, specially elaborate technical investigations such as are conducted by the experiment station, can be best accomplished by giving them the exclusive attention of the investigator. If the investigator's attention is diverted or interrupted by other work, his progress in his investigations is delayed in even greater proportion than is represented by the amount of time actually lost. . . . To a very limited extent the giving of instruction by the station may be advantageous, and it is perhaps detrimental to separate [station workers] entirely from contact with the ordinary work of the college, but, so far as is feasible, arrangement should be made to prevent their attention being diverted and their important work interrupted by other duties."

The establishment and maintenance of the graduate school, which "properly completes the work of the undergraduate college" is approved. The necessity for graduate training of specialists is recognized, and the provision of ample facilities and funds for its support is recommended.

The extension service is credited with having contributed much to the development of the farmer and to the agricultural wealth of the State. The desirability of close cooperation with other existing agencies for country-life improvement is set forth, and the commission believes that "the most logical and the most beneficial service the extension department has rendered has been in helping farmers in the improvement of agricultural methods." It recommends that it keep as closely as possible to that form of service, although there is nothing in the report which would preclude the college from studying rural problems in all their bearings.

The efforts of the college to coordinate its work with that of the State board of agriculture and other organizations interested in agricultural advancement and supported by the State are commended. As a further step in this direction the establishment by the legislature of a board for agricultural coordination is advocated. The duty of this board would be "to correlate the agricultural agencies of the Commonwealth, to supervise their respective publi-

cations, to prevent overlapping, and to secure the greatest efficiency and economy in their work."

The first need of the college is set forth as permanent and adequate financial support. "All of the other problems with which it is confronted can only be solved satisfactorily if requisite means are provided to meet the expense which their solution involves. Inadequate support means poor teachers, poor buildings, poor equipment, a second or third rate institution." The public is frankly advised that the college "will probably prove one of the most expensive institutions which the State maintains if it is to repay the State for its investment, and will grow more expensive the better instruction it gives."

Special consideration was given to a study of the best method of supporting the college. Of the four plans examined, that of millage appropriations, based on a fractional amount of the State's valuation, is deemed most advantageous to the institution, since in general it affords assurance of a certain relatively fixed income increasing with the advancing valuation of the State and with the developing needs of the college. The method chiefly followed in the past of annual appropriations based on estimates made directly to the legislature is characterized as unsatisfactory to both the college and the legislature, since it prevents the trustees from knowing sufficiently in advance what means they will have for the development of their plans, and has also apparently proved wasteful of the time of the college authorities and of the legislators.

A modification of this plan, which makes continuing specific appropriations to cover a definite period of years or until revoked, is deemed objectionable from the legislature's viewpoint because of its implication of a binding agreement upon subsequent legislators. If the appropriations are made for a fixed period, there is also "almost certain to be at the end of the period the kind of discussion of the college and its conduct that is not beneficial to it." The final plan studied, that of a general advance budget for all State institutions, "if carefully worked out and justly administered," is believed to be of great merit and applicable to the college.

The imperative need of several important buildings, additional improved live stock and other equipment, and more land is discussed in detail. An adequate and fireproof library building, to cost about $250,000, and a commodious chemical laboratory, "furnished with the best facilities for chemical instruction and research," are deemed particularly necessary. A suitable gymnasium and armory, a dormitory system commensurate with the growth of the college, including provision for the increasing number of women students, and a greatly enlarged central heating plant are also recommended. The need of planning ahead on such matters is set forth, and the policy

is favored of increasing the power of the trustees in such matters as the purchase of land and erection of buildings, subject to the approval of the governor and council, rather than requiring specific authorization by the legislature.

No change is suggested in the present methods of appointment of trustees and members of the faculty. It is thought desirable, however, that an age limit of 68 years be established for all teachers or scientific workers on the staff. Legislation providing a system of retiring allowances for such employees who have been in the service of the college at least 15 years is recommended, to be administered either by the trustees or the State Teachers' Retirement Board.

The question as to whether the college is or is not a State institution is taken up. It is stated that practically there can be no question in the matter, but since the trustees form a corporation some technical legal questions have been raised, and legislative action is recommended to settle the matter.

In conclusion the commission considers the relation of the college to the development of the agricultural resources of the State. It is brought out that because of various economic changes the acreage of improved land decreased nearly one-half from 1880 to 1910 and there was also a heavy decline in the number of milch cattle. During the same period, however, the yield and value of cultivated land and the productivity of the cows have increased materially.

The college is credited with valuable service in this direction, particularly by teaching farmers how to readjust themselves to the altered conditions. It "has done much and it can do more to develop the agricultural resources of the State, in directing farmers into new lines of agriculture such as market gardening, fruit growing, greenhouse products, and by showing them how, by teaching new methods of fertilization and cultivation, the productivity of their farms can be largely increased. Farming in these days and in this region can not be carried on profitably by old-fashioned methods. It must have the benefit of that advanced scientific and technical agriculture which the Massachusetts College was established to give."

The report of the Massachusetts commission thus contains much that is already familiar to agricultural educators, but not always understood and appreciated by the general public. It is a valuable restatement of some of the fundamental relationships of the agricultural college and the State, embodying as it does the conclusions of a commission broadly constituted and with sufficient time at its disposal for mature study. While not all of its findings are of general application or would meet with universal acceptance, the report as

a whole should prove most helpful, both in clarifying the situation in Massachusetts and also as a careful, conservative, but withal a constructive conception of the present status and value of the agricultural college in the American educational system.

It establishes clearly the idea of a strong institution of high grade, supported liberally and consistently by the State, to work for the enlightenment and advancement of agriculture through instruction of college grade, through research and experiment of fundamental character, and through extension teaching.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

An introduction to theoretical and applied colloid chemistry, W. Ostwald, trans. by M. H. Fischer (*New York: John Wiley & Sons, Inc., 1917, pp. XV+232, figs. 46*).—This is an authorized English translation of the work previously noted (E. S. R., 35, p. 8).

The action of aluminum chlorid on cymene, A. W. Schorger (*Jour. Amer. Chem. Soc., 39 (1917), No. 12, pp. 2671–2679*).

Tannin content of Pacific coast trees, H. K. Benson and F. M. Jones (*Jour. Indus. and Engin. Chem., 9 (1917), No. 12, pp. 1096–1098*).—Analytical data on western larch (*Larix occidentalis*), yellow pine (*Pinus ponderosa*), western hemlock (*Tsuga heterophylla*), dogwood (*Cornus nuttallii*), cottonwood (*Populus trichocarpa*), and alder (*Alnus oregona*) are submitted in tabular form.

An analysis was also made of a sample of Douglas fir which had been kept in a loosely stoppered jar for one year. The tannin content had been increased by 1.6 per cent. The total solids also increased, but a decrease in the nontannin material was noted.

From the data the authors conclude that Douglas fir slab wood selected for tannin extraction can be advantageously seasoned for one year. Western hemlock bark, western larch, and western pine seem also to yield extracts satisfactory both in quantity and quality. The dogwood appears to be suitable for use in extract manufacture, but only as a dye.

The indigenous tans and vegetable dyestuffs of New Zealand, B. C. Aston (*Jour. Agr.* [*New Zeal.*], *15 (1917), Nos. 2, pp. 55–62; 3, pp. 117–128*).—This is a general review and discussion of the subject, with references to the literature cited.

Comparative tests of chemical glassware, P. H. Walker and F. W. Smither (*Jour. Indus. and Engin. Chem., 9 (1917), No. 12, pp. 1090–1092, figs. 4*).—Data obtained in tests made at the Bureau of Standards of the U. S. Department of Commerce on Kavalier, Jena, and five American-made wares, which included chemical analysis, determination of coefficient of expansion, refractive index, condition of strain, and resistance to repeated evaporation, to heat, to mechanical shock, and to chemical reagents, are submitted in tabular and graphical form.

The results in general indicate that all the American-made wares tested are superior to Kavalier and equal or superior to Jena ware for general chemical laboratory use.

An efficient apparatus for frictional distillation under diminished pressure, W. A. Noyes and G. S. Skinner (*Jour. Amer. Chem. Soc., 39 (1917), No. 12, pp. 2718–2720, fig. 1*).—An apparatus which is considered to be highly efficient is described by a diagram. The apparatus consists essentially of a Claissen flask to which are attached a separatory funnel and a fractionating column. The advantages claimed for it are that it may be used advantageously with either small or large fractions of material by regulating the flow of the entrant fraction from the funnel, and that the successive fractions may be introduced without losing the vacuum.

The solubility of silica, V. Lenher and H. B. Merrill (*Jour. Amer. Chem. Soc., 39 (1917), No. 12, pp. 2630–2638, figs. 2*).—Data on the solubility of silica in water and in hydrochloric and sulphuric acids are reported in tabular and graphical form.

The solubility was found to be definite and to depend on the temperature and concentration. With gelatinous silica, equilibrum was reached in a few hours or, at most, in a few days. Equilibrium could not be obtained with ignited silica in days or weeks. The solubility of the gelatinous silica was found to be the same regardless of the method of preparing the gel. The true solubility of ignited silica is deemed to be the same as that of gelatinous silica, but saturation is not reached in any short period of time. The apparent solubility is somewhat less than that of gelatinous silica.

Study of the preparation of ammonium nitrate by double decomposition between sodium nitrate and ammonium chlorid, E. Rengade (*Rev. Gén. Sci., 28 (1917), No. 17–18, pp. 489–503, figs. 4*).—The author has studied the reaction

$$NaNO_3+NH_4Cl \rightleftarrows NH_4NO_3+NaCl$$

and has determined the optimum conditions for obtaining the largest yield of ammonium nitrate. The data are submitted in tabular and graphical form and discussed.

The nitrogen distribution in protalbinic and lysalbinic acids, Cornelia Kennedy and R. A. Gortner (*Jour. Amer. Chem. Soc., 39 (1917), No. 12, pp. 2734–2736*).—The authors, at the Minnesota Experiment Station, prepared protalbinic and lysalbinic acids by the action of alkali on egg albumin, and determined the nitrogen distribution in these substances, as well as in the original egg albumin, by Van Slyke's method (E. S. R., 26, p. 22).

No marked differences were observed in the nitrogen distribution of these substances and the egg albumin. Both the acids showed a somewhat greater apparent lysin content than the original egg albumin. This is considered due to the presence of ornithin, derived from arginin by the action of the alkali.

It is noted that the results presented "furnish no evidence as to whether or not the protalbinic and lysalbinic acids are true chemical compounds or as to whether or not their chemical structure is more simple than is that of egg albumin. It is extremely improbable, however, that either preparation has as low a molecular weight as 800."

The effect of prolonged acid hydrolysis upon the nitrogen distribution of fibrin, with especial reference to the ammonia fraction, R. A. Gortner and G. E. Holm (*Jour. Amer. Chem. Soc., 39 (1917), No. 12, pp. 2736–2745, fig. 1*).—The authors, at the Minnesota Experiment Station, hydrolyzed fibrin with 20 per cent hydrochloric acid for various periods of time, ranging from one hour to six weeks, and analyzed the resulting hydrolysates.

From the data obtained, it is concluded that the figures for ammonia nitrogen in an acid hydrolysate are not necessarily a true measure of the amid nitrogen in the protein molecule, but that they also include some ammonia derived from the deamination of certain of the amino acids, the extent of the deamination depending upon the length of hydrolysis. Monoamino acids are considered to be much more easily deaminized than the histone bases. Cystin is not the only amino acid which undergoes deamination when boiled with hydrochloric acid.

"The figures for arginin, histidin, and lysin in a Van Slyke analysis are not appreciably altered by a hydrolysis extending over six weeks, providing that all tryptophan has been so altered that it does not precipitate on the addition of phosphotungstic acid. If it does precipitate it will be calculated as histidin."

Increases in the insoluble humin nitrogen, due to prolonged hydrolysis, are regarded as due to carbonization. It is noted, however, that there is no means of proving or disproving this hypothesis at present.

The data are presented in tabular form and discussed.

Some nitrogenous auxoamylases, E. W. Rockwood (*Jour. Amer. Chem. Soc.*, *39* (*1917*), *No. 12*, *pp. 2745–2752*).—From experimental data submitted, it is concluded that both acyclic and cyclic compounds increase the power of the salivary ferment to hydrolyze boiled starch. In the cyclic compounds the action is the same whether the amino group is in the side chain or whether in the benzene ring. The salts from which the amino acids are derived do not have this action, thus indicating that the amino nitrogen is the activating agent. The position of the amino group in the benzene ring does not appear to cause any difference in activity. Acid amids, urea, etc., do not increase the hydrolytic power of the amylase. The sulphonic acid radical, when introduced into an amino compound instead of the carboxyl group, destroys the stimulating effect of the amino group. Imids do not possess this stimulating power.

Proteins are considered to act as auxoamylases toward ptyalin because of their nitrogen content, and as the number of free amino groups is increased by hydrolysis the activity of the hydrolyzed substances is also increased.

"The amino acids appear to act as auxoamylases toward the pancreatic enzym also. Hence the amino acids produced in the intestine by digestive proteolysis will act as hormones in starch digestion, and this factor should be taken into account in the study of normal digestion."

See also a previous note (E. S. R., 37, p. 204).

Analytical control of the ammonia oxidation process, G. B. Taylor and J. D. Davis (*Jour. Indus. and Engin. Chem.*, *9* (*1917*), *No. 12*, *pp. 1106–1110*, *figs. 2*).—In the course of some experiments on the oxidation of ammonia for the production of nitric acid the authors have developed several analytical procedures for determining the course of the reaction. These procedures are described and discussed in detail.

A method for the determination of ammonia nitrogen with formaldehyde, G. H. C. van Bers (*Chem. Weekbl.*, *14* (*1917*), *No. 42*, *pp. 968–975*).—The following procedure for the determination of ammonia nitrogen in ammonium sulphate is described:

Five gm. of the ammonium sulphate is dissolved in water and the solution made up to 100 cc. and filtered. Ten cc. of the filtrate is transferred to a small Erlenmeyer flask, and 1.2 cc. of a 35 per cent formaldehyde solution (specific gravity 1.083 at 15° C.) and 10 cc. of $\frac{8}{10}$-normal potassium hydroxid added. The flask is well stoppered, and the contents thoroughly shaken and allowed to stand overnight. Fifty cc. of boiled distilled water is added and the excess alkali titrated with tenth-normal sulphuric acid, using phenolphthalein as indicator. The proper corrections should be made for the acid in the solution and also in the formaldehyde. The percentage of nitrogen in the material is calculated by subtracting the number of cubic centimeters of tenth-normal acid, plus the acid found in the blanks, from the number of tenth-normal cubic centimeters of alkali used, and multiplying the difference by 0.2802. If the quantity of nitrogen in the sample is less than 19 per cent some slight modifications are necessary.

The procedure is considered to yield as accurate results and to be less time consuming than the usual distillation procedure. The use of a burner is also eliminated.

The use and value of various indicators in ammonia titrations are briefly discussed.

The determination of potassium and sodium in the ash of vegetable substances, H. Pellet (*Ann. Chem. Analyt.*, *22* (*1917*), *Nos. 7*, *pp. 146–152*; *9*, *pp. 179–185*).—To ash the material it is recommended to incinerate at a low heat

and extract the carbonized mass with water. The insoluble portion is then ignited separately and the ash added to the solution, which is evaporated and the residue gently heated.

For the determination of potassium and sodium 5 gm. of the ash is repeatedly extracted with boiling water and the extracts filtered into a 500-cc. flask. After thoroughly washing and cooling the solution to room temperature, it is made up to volume. To 200 cc. of this solution 50 cc. of a saturated solution of barium hydroxid is added in small amounts at a time with thorough shaking. After allowing the precipitate to settle, phenolphthalein is added and the solution treated with carbon dioxid until it is decolorized. Several cubic centimeters of a saturated solution of ammonium carbonate are added, the solution heated, filtered, the filtrate evaporated to dryness, and the residue ignited. This residue is extracted with water, the solution filtered, and the filtrates evaporated after the addition of hydrochloric acid. The residue of chlorids thus obtained is ignited at a low temperature and weighed. Ammonium carbonate solution may be used instead of the carbon dioxid for the removal of the excess of barium hydroxid. The barium hydroxid removes the carbonates, sulphates, and phosphates as insoluble barium salts and also the magnesium and titanium.

The potassium in the mixed chlorids is determined by precipitation with chloroplatinic acid. The filtrate and washings obtained by washing the chloroplatinates with a mixture consisting of 500 cc. of 80 per cent alcohol and 80 cc. of ether are evaporated to remove the alcohol and ether and boiled with an excess of ammonium formate. The reduced platinum is separated by filtration, the filtrate evaporated to dryness, and the residue ignited to expel ammonium salts. The ignited residue is treated with a few drops of hydrochloric acid, evaporated, and the sodium chlorid thus obtained weighed after gentle ignition. The amount of potassium may be checked by reducing the potassium chloroplatinate with sodium formate and weighing the platinum black obtained.

The recovery of perchloric acid from residues obtained in the determination of potassium, A. Vürtheim (*Chem. Weekbl., 14 (1917), No. 43, pp. 986–988*).—The author describes a procedure for the recovery of perchloric acid from potassium perchlorate and from alcoholic filtrates containing the soluble perchlorates of sodium, magnesium, and calcium. The latter are dried and the residues used in the recovery. The procedure consists in treating the dry material with 97 per cent sulphuric acid and distilling at 170° C. under a reduced pressure of about 55 mm. The perchloric acid is collected in ice-cold distilled water. Some chlorin and also sulphuric acid are carried over into the distillate but are easily removed, the former by boiling the solution and the latter by precipitation with barium chlorid. After the removal of these substances the acid is made to the proper concentration required for analysis.

The procedure has been found to be economical, especially in view of the present scarcity and high price of perchloric acid.

A rapid method for the determination of lime as calcium sulphate, L. G. Willis and W. H. MacIntire (*Jour. Indus. and Engin. Chem., 9 (1917), No. 12, pp. 1114–1116*).—The following modified procedure is described by the authors, at the Tennessee Experiment Station:

The calcium is carefully precipitated as oxalate, reprecipitated if necessary where the magnesium content is appreciable, and the precipitate ignited in a small platinum dish or platinum or porcelain crucible over a Bunsen flame or in a muffle until the filter is completely incinerated. For each approximate 0.2 gm. of calcium carbonate enough of a 1:1 finely ground and dried mixture

of ammonium sulphate and ammonium chlorid to insure an excess of approximately 0.3 gm. of sulphate is added. The materials are thoroughly mixed in the crucible by means of a small glass rod. The crucible is now inserted in a circular opening cut in a piece of asbestos board placed horizontally, the upper half of the crucible extending above the upper surface of the asbestos. A nearly horizontal flame from a small Bunsen burner is directed across the surface of the crucible in such a manner as to have the side of the crucible nearest the flame intensely heated. The conducted heat will effect volatilization without spattering.

The procedure has been thoroughly tested and found to be reliable and especially well adapted for determining large amounts of lime and also in sets containing widely varying percentages.

A modified method for the determination of fluorin with special application to the analysis of phosphates, C. R. WAGNER and W. H. ROSS (*Jour. Indus. and Engin. Chem., 9 (1917), No. 12, pp. 1116–1123, fig. 1*).—The authors have studied the various methods which have been proposed for the determination of fluorin in the presence of phosphorus, and have developed a procedure which consists in volatilizing the fluorin as silicon fluorid, collecting the latter in water to form hydrofluosilicic acid, and titrating the acid with standard sodium hydroxid, using phenolphthalein as indicator. The apparatus necessary in the procedure and its manipulation are described in detail. In samples previously freed from water and organic matter (by burning) a complete analysis can be effected in one hour. The method is indicated as being applicable to material containing as low as 0.01 per cent fluorin.

The sulphur trioxid, sulphur dioxid, and other products evolved, which may be present as hydrochloric and nitric acids, are removed by selective reagents through absorption so that a hydrofluosilicic acid entirely free from other acid constituents is obtained.

The mechanical analysis of soil, U. PRATOLONGO (*Staz. Sper. Agr. Ital., 50 (1917), No. 3–5, pp. 117–166, figs. 4*).—The material reported is divided into three parts, (1) the problem and methods of the mechanical analysis of soil, (2) a new rapid method for the mechanical analysis of soil, and (3) experimental researches on a method of mechanical analysis by sedimentation.

The apparatus and the manipulation of the new method are described in detail and the experimental data reported in part 3 are discussed..

A note on a modified method for determining carbonates in soil, H. A. TEMPANY and R. E. KELSICK (*West Indian Bul., 16 (1917), No. 3, pp. 259–261, fig. 1*).—A modification of the method previously described by Watts (E. S. R., 14, p. 848), which consists essentially in the substitution of an ordinary water filter pump for the mercury pump originally employed and in the use of an ordinary suction flask in place of a special receiver for the absorption of carbon dioxid by the barium hydroxid. is described. Comparative determinations with the original method show the modified procedure to yield accurate results and to possess a number of advantages.

Examination of water, W. P. MASON (*New York: John Wiley & Sons, Inc., 1917, 5. ed., rev., pp. VI+186, pls. 2, figs. 19*).—This is the fifth edition of the well-known work previously noted (E. S. R., 23, p. 11).

A volumetric method for the determination of formic acid or formates in the presence of hydroxids, carbonates, oxalates, and acetates, F. TSIROPINAS (*Jour. Indus. and Engin. Chem., 9 (1917), No. 12, pp. 1110, 1111, fig. 1*).—A method, which is based on the quantitative oxidation of formic acid to carbon dioxid by chromic acid in boiling solution, and the necessary apparatus and its manipulation are described in detail. The carbon dioxid evolved is measured

in a suitable burette, and after reduction of the volume obtained to standard conditions the amount of formic acid is easily calculated.

In samples which contain carbonates, bicarbonates, oxalates, etc., these materials are removed by precipitation with a 10 per cent solution of calcium chlorid and an aliquot of the filtrate oxidized as in the regular procedure.

Analytical data obtained in the analysis of pure solutions of sodium formate and solutions with the addition of carbonate, bicarbonate, and oxalate indicate that the method is accurate and reliable for technical determinations.

The determination of salicylic acid in foods, H. D. Steenbergen (*Chem. Weekbl., 14 (1917), No. 39, pp. 914–921*).—A modified iodometric method is described which consists of treating the extract containing salicylic acid with a bromate-bromid solution and a $\frac{6}{100}$-normal bromin solution, setting the bromin free with hydrochloric acid (specific gravity 1.13), and after 15 minutes adding an excess of potassium iodid and titrating the iodin set free with standard thiosulphate. The reactions taking place are indicated as follows:

$$C_6H_4(OH)COOH+8Br=C_6H_2Br_3OBr+4HBr+CO_2$$
$$C_6H_2Br_3OBr+2KI=C_6H_2Br_3OK+KBr+2I$$

Comparative analytical data of the usual acidimetric and the modified iodometric methods are submitted, together with data on the extraction of the salicylic acid from the original samples.

A new and simple procedure for determining the fineness of wheat flour, F. Perracini (*Staz. Sper. Agr. Ital., 50 (1917), No. 3–5, pp. 250–252*).—A procedure which consists of treating a 5-gm. sample of the flour with 1 per cent copper sulphate solution and comparing the color which develops with a standard sample, similarly treated, is briefly described.

Some new methods for determining the fineness of flour, G. Lo Priore (*Staz. Sper. Agr. Ital., 50 (1917), No. 3–5, pp. 253–259*).—The author discusses the colorimetric method previously described, and also a method based on the determination of the pentosans in the sample.

The conservation of tomatoes, P. Guarnieri (*Staz. Sper. Agr. Ital., 50 (1917), No. 3–5, pp. 245–249*).—This article deals with the organoleptic, physical, and chemical examination of tomatoes and the consideration of the analytical results obtained.

A note on the determination of the nonfatty solids in milk from the specific gravity at tropical temperatures, H. A. Tempany (*West Indian Bul., 16 (1917), No. 3, pp. 262–264*).—A table showing the percentage of nonfatty solids in milk corresponding to lactometer readings at 30° C. (88° F.) has been constructed and is submitted, together with some analytical data which indicate the accuracy attained in the use of the table. The table was constructed to obviate the usual procedure of cooling the sample to temperatures required for the usual conversion tables.

A study of the estimation of fat in condensed milk and milk powders, C. H. Biesterfeld and O. L. Evenson (*Jour. Indus. and Engin. Chem., 9 (1917), No. 12, pp. 1111–1114, fig. 1*).—The authors have studied the usual errors inherent in the Röse-Gottlieb method and have compared it with a modified method in which a small amount of acetic acid, as an aid in separating the fat from the casein, mixtures of petroleum ether, ethyl ether, and ethyl alcohol (which are recoverable for repeated use), and a modified Röhrig tube (E. S. R., 16, p. 1050) are used. The two mixtures used in the modified method consist of (1) 400 cc. of petroleum ether, 200 cc. of ethyl ether, and 20 cc. of 95 per cent ethyl alcohol, (2) 350 cc. of petroleum ether, 280 cc. of ethyl ether, and 63 cc. of 95 per cent ethyl alcohol. The modified procedure is as follows:

In a modified tube from 4 to 4.5 gm. of evaporated milk or from 7 to 7.5 gm. of a 40 per cent emulsion of sweetened condensed milk are diluted to a volume of 9 cc. with water and, after mixing with 1.5 cc. of concentrated ammonium hydroxid, 15 cc. of 95 per cent alcohol is added and the whole mixed again. The mixture is then shaken vigorously for 2 minutes with 50 cc. of mixture 1. After standing for 10 minutes the fats are filtered through a 4-cm. Dreverhoff No. 86 fat-free filter paper into a 100-cc. Erlenmeyer flask, previously dried and weighed. The tip of the spigot of the modified tube and the paper are washed with a few cubic centimeters of mixture 1, and the funnel with the paper set aside for future use. The ethers are distilled on a hot plate, using cork stoppers covered with tin foil for connecting with the condensers, until approximately 4 cc. remains. The recovered ethers are returned to bottle 1 and the liquid in the tube mixed with 3 cc. of glacial acetic acid. The tube, immersed in water at 60–65° C. by a wire so that the tip of the spigot is just above the water, is heated to 80° in about 10 minutes. The tube is removed, cooled in running water, and shaken vigorously for about 2 minutes with 50 cc. of mixture 2. After standing a few minutes the ethers are filtered through the reserved filter paper into an unweighed 100-cc. Erlenmeyer flask, distilled, and returned to bottle 2.

This extraction is repeated with 50 cc. of mixture 2, and the ethers filtered into the same unweighed flask. The tip of the spigot and filter paper are washed with mixture 2 and the ethers distilled as before. The flask is freed from the residual liquid and acetic acid vapors and dried completely by heating on a steam bath while applying suction. The fat is then dissolved with 25 cc. of petroleum ether, using small quantities at a time, and filtered through the same filter as before into the weighed flask containing the first extract. The petroleum ether is recovered, and the fat dried at 100° to constant weight and weighed.

From some work on the Harding-Parkin method (E. S. R., 29, p. 507) it is concluded that the higher results obtained with this method are due to the use of rubber stoppers in contact with the solvents.

Analytical data obtained in the study show that the error of the Röse-Gottlieb method as applied to condensed milk is small, the average being about 0.04 per cent. The method may also give low results when applied to milk powder or cream. This error may be corrected by an extraction in the presence of acetic acid. The method described is considered to extract free fatty acids and more completely separate the fat from the protein, recovering a trace of fat not obtained by alkaline extraction. The economy in the use of solvents is also noted.

Outline for the analysis of sugar products, H. Lajoux and L. Ronnet (*Jour. Pharm. et Chim., 7. ser., 16 (1917), No. 7, pp. 199–204*).—The authors submit an outline for the examination of sirups, confections, honeys, etc., in tabular form which is deemed especially useful for routine examinations. Brief notes on the details of the various procedures are also given.

A method for the determination of alcohol, C. J. Haines and J. W. Marden (*Jour. Indus. and Engin. Chem., 9 (1917), No. 12, pp. 1126, 1127*).—The following modified method is described:

Ten cc. of the alcoholic solution at 15.6° C. is measured into graduated tubes of 15 cc. capacity and potassium fluorid added until the volume reads 13 cc. A small crystal of malachite green is dropped in, which serves to color the alcohol layer so that the volume can be easily read. Other substances could be used, but the malachite green has been found to be very satisfactory. The tube is then closed with a tight-fitting stopper and shaken vigorously for about 2 minutes. If the potassium fluorid is dry, the solution warms up but when

placed in the centrifuge for 2 or 3 minutes cools to room temperature. The alcohol separates in the upper layer, while the excess of solid salt settles to the bottom of the tube. From the volume of alcohol observed and the volume of alcoholic liquid used for the determination, the percentage of alcohol by volume is readily found. Since 1 cc. of alcohol changes about 0.001 cc. per degree Centigrade at room temperature, the volume can be corrected to 15.6° if desired. When the readings are made from the bottom of the meniscus it is necessary to add 0.15 cc. to observed readings to allow for the small amount of alcohol not precipitated by the potassium fluorid and the amount of alcohol adhering to the sides of the tube.

Analytical data obtained on solutions of known alcohol content and on a number of commercial materials indicate the accuracy of the method. The procedure is not applicable to solutions containing less than 1 or 2 per cent of alcohol or to solutions in which other liquids, such as acetone, essential oils, etc., are present.

On the detection of methyl alcohol in alcoholic beverages and its formation by the several kinds of yeasts, T. TAKAHASHI, M. GUNKE, and T. YAMAZAKI (*Jour. Amer. Chem. Soc., 39 (1917), No. 12, pp. 2723–2726*).—In the examination of the distillates of a number of alcoholic beverages, formaldehyde could not be found directly when the material was distilled below 80° C. After the oxidation, however, differences as to the quantities of methyl alcohol were observed according to the kinds of material examined. The smallest quantity was found in the case of "saké." In the case of a doubtful test, a large sample is recommended, followed by the redistillation of the distillate. All the kinds of yeasts tested (saké, beer, wine, and distillery yeasts) formed methyl alcohol in sugar solutions, the quantity increasing with the addition of glycocoll as a nourishment.

A colorimetric method for the estimation of the cresol or phenol preservative in serums, E. ELVOVE (*Pub. Health Serv. U. S., Hyg. Lab. Bul. 110 (1917), pp. 25–33*).—After some preliminary work the following procedure was devised:

Five-tenths cc. of the sample is measured out with a finely graduated and accurately standardized 1-cc. pipette, transferred to a 1,000-cc. Erlenmeyer flask, diluted with distilled water to about 275 cc., and then mixed with 25 cc. of diluted sulphuric acid (1 part H_2SO_4, specific gravity 1.84, with an equal volume of distilled water). The flask is connected with a suitable glass condenser and the contents distilled until 200 cc. of the distillate is collected in a 200-cc. measuring flask. The distillate is filtered through a dry folded filter into a glass-stoppered bottle and then thoroughly mixed. To 5 cc. of the freshly prepared Millon reagent, in a narrow 50-cc. Nessler tube, 10 cc. of the distillate is added and the whole thoroughly mixed with a bulbed glass rod. Four standards of tricresol solution are simultaneously mixed in a similar manner. The color which develops in the sample after standing for 10 minutes is compared with that developed by the standards.

Varying results were observed in using Millon's reagent prepared according to the directions given by various authors. The Millon reagent used in the work reported is prepared by treating 68 gm. of mercury in a 250-cc. beaker with 50 cc. concentrated nitric acid (specific gravity 1.405 at 25° C.). To the resulting solution 92 cc. distilled water is added and then 2.76 cc. concentrated nitric acid. The mixture is thoroughly shaken until the precipitate which often forms is completely redissolved.

Commercial evaporation and drying of fruits, J. H. BEATTIE and H. P. GOULD (*U. S. Dept. Agr., Farmers' Bul. 903 (1917), pp. 61, fig. 23*).—This publication discusses in general the principles and methods of drying, buildings and

equipment for drying, evaporation of various fruits by artifical heat, equipment and details of sun drying, details as to the preparation of evaporated and dried fruits for market, insects injurious to dried fruits, and laws relating to evaporated and dried fruits.

Homemade fruit butters, C. P. CLOSE (*U. S. Dept. Agr., Farmers' Bul. 900 (1917), pp. 7*).—This briefly discusses and gives directions for preparing a few of the more common home products.

Contribution to the study of the viscous fermentation of beet juice, H. DELAVAL (*Ann. Sci. Agron., 4. ser., 5 (1916), No. 7–9, pp. 323–336*).—The author has studied the morphology, optimum conditions for growth, character of cultures, metabolic products, effect of various influences on growth, and effect of antiseptics on various microorganisms which are held responsible for viscous fermentation. The condition is indicated as being rather difficult to control, and the necessity of the complete sterilization of the utensils used in the fermentation is emphasized.

Contribution to the study of alcoholic fermentation, E. KAYSER (*Ann. Sci. Agron., 4. ser., 5 (1916), No. 7–9, pp. 297–322*).—Experimental data obtained in a study of the production of alcohol from various raw materials are submitted and discussed.

Field tests made on oil treatment of wood against marine borers, C. H. TEESDALE and L. F. SHACKELL (*Engin. News-Rec., 79 (1917), No. 18, pp. 833–837, figs. 6*).—This is an experimental study of the value of various preservatives and methods of treatment. The results in general show that a proper creosote oil for marine work should contain a large proportion of constituents boiling above 320° C., as well as considerable amounts of high boiling tar acids and bases.

METEOROLOGY.

Agricultural meteorology, J. W. SMITH (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 2, pp. 75–92, figs. 5*).—This article discusses what has been done and what it is considered possible to do in the way of coordinating meteorological observations with agricultural production, outlining especially the general program of the section of agricultural meteorology of the Weather Bureau of the U. S. Department of Agriculture. Some of the possibilities of this line of investigation are illustrated by results of studies made by the author on the correlation between temperature and rainfall and yield of corn and winter wheat and on the critical period for potatoes.

The economic aspect of climatology, E. L. WELLS (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 2, pp. 240–249*).—This article briefly discusses some of the economic relations of climatology to agriculture, engineering, transportation, commerce, manufacturing, health and efficiency, recreation, and the like. A short bibliography of the subject is added.

Forecasts of weather favorable to an increase of forest fires, E. A. BEALS (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 2, pp. 257–270, figs. 8*).—This article discusses the damage caused by forest fires in the United States, describes the weather conditions most favorable for such fires, and makes a plea for more extended study of such conditions with a view to improving the forecasts of wind as well as of other elements that cause an increase in the number of forest fires.

The meteorological influences of lakes, E. R. MILLER (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 2, pp. 189–198, figs. 9*).—"The object of this paper is to call attention to the relatively important effects of the land and sea breezes

and of the monsoons of the Great Lakes of North America, notwithstanding the interference that their typical development suffers from the procession of cyclonic and anticyclonic eddies of the west wind belt."

It is shown in the paper "that lakes exercise an important influence upon the climate of their adjacent lands, even in the belt of westerly winds, where their influence is often obscured by eddy motions on a larger scale. Their influence is not restricted to the simple transfer of moist, cool lake air to the adjacent shores on hot summer days, or to the tempering of passing cold waves, but their influence extends, on account of the special phenomena of ascending and descending air currents, to regions far from the lake shores, where they cause heavier rainfall in the warmer months and clear, frosty nights whenever the land surface temperature is lower than that of the lake surface."

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 4 (1917), Nos. 7, pp.* [*215*], *pls. 3, figs. 3; 8, pp.* [*215*], *pls. 3, figs. 3*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for July and August, 1917.

Meteorological records, E. Burke (*Montana Sta. Rpt. 1916, pp. 185–190*).—Tabular monthly and annual summaries are given of observations at Bozeman, Mont., during 1916 on temperature, rainfall, cloudiness, and direction of the wind. Data are also given for monthly mean dewpoint, humidity, and vapor pressure from 1902 to 1916, and for daily evaporation and wind movement for June to October, 1916, inclusive. The highest temperature observed during the year was 90° F. July 7, lowest −33° January 27, mean 38.2°, last killing frost in spring June 12, first killing frost in fall September 14, total rainfall 21.19 in., greatest monthly precipitation 2.99 in. (May), rainy days (0.01 in. or more) 117, and clear days 155.

Report of the consulting meteorologist, J. F. Voorhees (*Tennessee Sta. Rpt. 1913, pp. 161–163, figs. 5*).—Charts show the rainfall of Tennessee in 1913 as compared with the normal, also the distribution of the rainfall in different parts of the State. It is stated that "the total rainfall for Tennessee in 1913 was only 1 in. below the yearly normal, but the distribution was such that its efficeincy was far below the average. . . . The greater portion of the State had a wet winter and an early spring, followed by the driest growing season on record." The record emphasizes "the need for deep tillage, humus, and a cover crop for catching, conserving, and using the rainfall."

Report of the consulting meteorologist, J. F. Voorhees (*Tennessee Sta. Rpt. 1914, pp. 285, 286, figs. 5*).—Attention is called especially to the deficiency of rainfall throughout Tennessee in 1914, which did serious damage to spring-sown grains, early corn, early potatoes, and other early crops, and emphasizes the advantage of sowing cereals in the fall as well as the need for tillage methods that promote the storage of the surplus rainfall of wet months for use during succeeding dry periods. The results secured in a continuation of a study of the relation of weather conditions to the growth of soy beans and corn carried on at 15 widely separated stations in the State are referred to as indicating "that there is a marked shortening of the period of growth with increase of temperature; that variation in rainfall has little or no effect on the length of time required for these crops to mature; and that there is some other very important factor whose influence increases as the season advances. This influence increases more uniformly and to a later date than air temperature. It is thought that soil temperature may be this other factor."

Report of the consulting meteorologist, J. F. Voorhees (*Tennessee Sta. Rpt. 1915, pp. 130–132, figs. 2*).—Charts showing the distribution of rainfall in different parts of Tennessee during 1915 are given and discussed.

The relation of July rainfall to the yield of corn in the State, for a period of 22 years, is also shown in a chart. "In addition to the marked relation shown by the chart there is another feature worthy of a little study. Dividing the record into two periods of 11 years each, it is found that the average rainfall for the first period was 4.63 in. and the average yield of corn was 22 bu. per acre. The average rainfall for the second period of 11 years was 4.78 in. and the average corn yield was 25.1 bu. per acre. The increase in yield, then, is 3.1 bu. with an increase in rainfall of 0.15 in. By the use of a correlation table it can be easily shown that an increase of 0.15 in. in rainfall could not be expected to increase the yield more than 0.1 bu. per acre. The rest of the increase, 3 bu. per acre, is therefore probably due to better farming methods."

The weather and climate of Salt Lake City, Utah, A. H. Thiessen (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 2, pp. 205–225, figs. 17*).—This paper shows not merely the averages but the extremes and variations from the normal of the principal meteorological elements as recorded at Salt Lake City since 1875. The data show an equable climate which is ascribed to the fact that very few storms pass directly over the city and that the city is in a sheltered position in the mountains.

The climate of Cuba, M. Gutiérrez-Lanza (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 2, pp. 132–172, figs. 11*).—The available climatic data for Cuba are quite fully reviewed in this article (in the Spanish language).

SOILS—FERTILIZERS.

Soil moisture studies under dry farming, F. S. Harris and J. W. Jones (*Utah Sta. Bul. 158 (1917), pp. 51, figs. 33*).—This bulletin reports the results of experimental work conducted in cooperation with the U. S. Department of Agriculture at the Nephi substation, involving rather extensive soil moisture studies on a deep alluvial reddish-brown clayey to sandy loam, for the period of 1908 to 1916, inclusive. Meteorological data, presented in tables, show the average precipitation for the period 1898 to 1916, inclusive, to have been 13.48 in., about 85 per cent of which fell during the nongrowing season between October and May. The average evaporation from a free-water surface during April to October, inclusive, for the period of 1908 to 1916, amounted to 47.6 in. The average wind velocity for the summer months approximated 4.5 miles per hour, while the temperature seldom reached 100° F. The plats were sampled in 1-ft. sections to a depth of 6 ft., with a soil tube in the spring, summer, and fall, with the exception of one series of plats sampled to a depth of 10 ft.

The experimental work herein reported embraced a comparison of numerous field practices deemed especially valuable in the accumulation and utilization of soil moisture under conditions prevailing at the substation, and is described under the general headings of stubble treatment, plowing, cultivation of fallow, mulches, crops, manure, and storage and use of water by winter wheat in 1915 and 1916.

The results are discussed in considerable detail, illustrated by diagrams and summarized as follows:

"Disking stubble before fall plowing or after harvest before spring plowing was not beneficial in moisture storage. Burning stubble before fall plowing slightly increased the moisture content of fallow.

"More moisture was held in the upper 6 ft. of spring-plowed than of fall-plowed fallow. In years of high precipitation, moisture was stored to a depth of 7 ft. in summer fallow, while in dry years it accumulated only to a depth of 3 or 4 ft. Plowing both in the fall and in the spring did not store more moisture than either spring or fall plowing alone. Practically the same amount of moisture was found in land plowed shallow, deep, and subsoiled.

"Cultivation of fall-plowed fallow by eradicating weeds and volunteer grain conserved a great deal of moisture, but the cultivation of spring-plowed fallow was of doubtful value.

"Mulched fallow retained only slightly more moisture than fallow on which the weeds were killed with a sharp hoe but not mulched; hence, destroying weeds is more important than maintaining a mulch in conserving moisture in fallow land. Straw mulches were more efficient in preventing evaporation than soil mulches. Deep mulching was more effective in retaining moisture in spring-plowed fallow than in fall-plowed fallow. Fallow soil lost from 0.5 to 2 per cent in addition to the rainfall between spring and fall of the fallow summer.

"Continuously cropping to winter wheat did not deplete the moisture supply to a depth of 10 ft. more thoroughly than alternate cropping. Although the intertilled crops—corn, peas, and potatoes—used moisture to a depth of 5 ft., they did not dry the soil so thoroughly nor so deeply as did winter wheat.

"Manure, especially when as much as 20 tons to the acre was added, increased the water-holding capacity of cropped soil and slightly increased that of the second foot in fallow.

"Winter wheat used moisture to a depth of 6 ft. Stubble and fall-plowed soils gained considerable moisture to a depth of 6 ft. between the fall of 1915 and spring of 1916. Moisture penetrated deeper and more quickly in moist than in dry soil. Summer tillage aided materially in conserving soil moisture.

"At Nephi about 18 in. of water can be stored in the upper 6 ft. of soil. Indications are that crops extend their roots into the lower soil layers for water, but that little moisture is raised from great depths by capillarity in this soil. It required from 0.5 to 1 in. of rain in the fall to connect the dry surface soil on fallow with the moist soil below.

"The minimum point to which winter wheat used water from the soil was about 10 per cent. Hence, water above 10 per cent is available for this crop.

"From 54 to 65 per cent of the precipitation falling between September 20 one year and the following September was found in the upper 6 ft. of soil. Fallow land at Nephi averaged 17.5 per cent water in the upper 6 ft. of soil in the fall. At seeding time about 6.4 in. of this moisture was available for plants. During the winter after the fallow there is usually about 4 per cent, or 3.5 in., of available moisture stored. Probably never more than 10 in. of water in the upper 6 ft. of this soil is available for plant use. Even in the best years following a fallow considerably less than one year's precipitation was available for crops in the first 6 ft. of the soil."

Soil moisture studies under irrigation, F. S. Harris and A. F. Bracken (*Utah Sta. Bul. 159 (1917), pp. 26, figs. 19*).—This bulletin reports the results of several thousand moisture determinations of cropped and uncropped field soils during a number of years under irrigation, in a study of some of the problems of soil moisture movement and distribution under field conditions, including experiments with potatoes and beets under irrigation, observations of moisture conditions in furrow irrigation and after flooding, the effect of mulches in conserving moisture, a comparison of cropped and fallow soils, and the effect of manure. The work was conducted on a deep, rich clay loam, dark in color

and uniform in texture to a depth of at least 10 ft. and containing approximately 40 per cent calcium and magnesium carbonates. Various amounts of irrigation water were used, and 1-ft. sections of soil taken to a depth of 10 ft. were collected at different intervals of time before and after the irrigation treatments. The results are discussed in some detail and pictured diagrammatically, and may be briefly summarized as follows:

A marked similarity was apparent in the content and distribution of moisture in soils producing potatoes and sugar beets. The efficiency of the water decreased with the amount applied, 1-in. weekly applications showing a greater increase in moisture to a depth of 10 ft. in proportion to the amount applied than either 2.5, 5, or 7.5 in. weekly and also gave a higher crop yield.

The initial percentage of moisture in the soil influenced the distribution of the irrigation water applied. Furrow irrigation was found to be more effective in conserving moisture than flooding. The lateral movement of soil moisture after irrigation was slow, particularly in the upper feet.

A straw mulch proved to be more effective in moisture conservation than an earth mulch, and the latter more effective than no mulch with the weeds pulled, although after the eighth day the differences were so small that the advisability of mulching hinged on the question of labor. When no irrigation water was applied the soil retained as much moisture where the weeds were pulled as where the soil was cultivated.

The crop was able to reduce the soil moisture to a depth of 10 ft., the difference in the moisture content of cropped and uncropped soil decreasing with an increase in the amount of irrigation.

Manure had very little effect upon the distribution of moisture in the soil.

It is concluded that the application of more irrigation water than is actually required to satisfy the needs of the crop is a wasteful practice.

The rate of water movement in aerated soils, H. E. Pulling (*Soil Sci.*, *4* (*1917*), *No. 3*, *pp. 239–268*, *figs. 13*).—Osmometer experiments conducted at the University of Wisconsin on nontoxic, nonsaline black sandy loam garden soil and sandy soil are reported and discussed. A form of osmometer specially adapted to the study of mass or molar movement of the soil water is described and its methods of use are explained in detail, as are the reducing and plotting in form of graphs of the data obtained.

A list of 22 references to literature on the subject is given.

The shrinkage of soils, H. A. Tempany (*Jour. Agr. Sci.* [*England*], *8* (*1917*), *No. 3*, *pp. 312–330*, *figs. 4*).—Experiments are reported in which by determination of the internal pore space in blocks of soils and comparison with the observed value for the linear shrinkage it was found that a linear relationship appeared to exist between the two values. This relation is expressed by the equation

$$C=\left(3a-\frac{3a^2}{10^2}+\frac{a^3}{10^4}\right),$$

in which C=the percentage of cubical contraction and a the percentage of linear contraction.

By extrapolating the curve thus obtained an approximation for the limiting value of the shrinkage in the case of pure colloidal clay was arrived at amounting to approximately 23 per cent. On this assumption it was possible to calculate the approximate content of colloidal material in any soil from a knowledge of the linear shrinkage. Results are adduced showing the values obtained for the shrinkage in the case of separated fine silt and clay fractions in the case of two soils of known shrinkage and physical composition and compared with the values calculated from previous assumptions. The results of the calcula-

tion of the content of colloidal clay in the foregoing manner in the case of 16 Leeward Islands soils are appended.

The proof of microbial agency in the chemical transformation of soil, H. J. Conn (*Science, n. ser., 46 (1917), No. 1185, pp. 252–255*).—The author is of the opinion that "to show conclusively the agency of any microorganism in any chemical transformation occurring in soil, the following steps are necessary: (1) The organism must be shown to be present in active form when the chemical transformation under investigation is taking place, (2) it must be shown to occur in larger numbers under such conditions than in the same soil in which the chemical change is not occurring, (3) it must be isolated from the soil and studied in pure culture, and (4) the same chemical change must be produced by the organism in experimentally inoculated soil, making the test, if possible, in unsterilized soil."

[Soil bacteriology], C. M. Hutchinson (*Ann. Rpt. Bd. Sci. Advice India, 1915–16, pp. 114–116*).—In studies of soil toxins and nitrification "a series of field experimental plats under wheat demonstrated the production of infertility in soil containing nitrogenous organic matter (oil cake) as a consequence of semianaerobic conditions artificially induced by water-logging. This infertility did not occur to the same extent when ammonium sulphate was substituted for cake, nor did the effect of the water-logging become apparent until the roots of the plants had gone down some inches, to that level in the soil which oxidation consequent on the cultivation had failed to reach. Parallel plats with barley illustrated this effect more markedly than those with wheat. . . . Laboratory work on nitrification and on the growth of seedlings in water and soil cultures demonstrated the possibility of separating substances from certain bacterial cultures, from decomposing organic matter, and from anaerobically incubated soil whose toxicity to nitrifiers, and in greater concentration to seedling plants, was demonstrable under these conditions.

"Observations were made as to the interference with the growth of seedlings resulting from the bacterial invasion of the unexhausted and still attached seed and the consequent absorption by the plant of toxic bacterial by-products. This invasion occurred most readily in water-logged soil and more especially in the presence of the bacteria derived from anaerobically incubated soils of high organic matter content. Copper sulphate was found to neutralize most of the toxic bodies obtained in this way, and seeds treated with this salt were found to be immunized to some extent, although not entirely or invariably, against this action."

The influence of arsenic on the bacterial activities of a soil, J. E. Greaves (*Sci. Mo., 5 (1917), No. 3, pp. 204–209*).—This is a review of work on the subject at the Utah Experiment Station, it being pointed out that arsenic by various means stimulates the bacterial activities of soil, which results in greater crop yields. "This increased growth must be looked upon as due to a stimulant and not to the direct nutritive value of the substance added, and soils so treated would wear out more quickly and produce larger crops than would soils not so treated. It is . . . important to know that arsenic has to be applied to a soil in enormous quantities before it retards microscopic plant life, and most likely before it retards the growth of higher plants." "Other experiments have demonstrated that the addition of arsenic to a soil causes the liberation of the insoluble plant foods of the soil, especially the phosphorus.

The effects of alkali salts on nitrification, P. E. Brown and E. B. Hitchcock (*Soil Sci., 4 (1917), No. 3, pp. 207–229, figs. 14*).—Experiments conducted at the Iowa Experiment Station to determine the concentration at which various alkali salts become toxic to nitrifying bacteria in alkali soil and in normal soil are reported.

It was found that "nitrification in normal soil is stimulated by small amounts of sodium chlorid, sodium sulphate, and magnesium sulphate, and large amounts of calcium carbonate. These salts become toxic, however, at certain points, which undoubtedly vary in different soils. With this soil in laboratory tests the toxic point was 0.02 per cent sodium chlorid, 2 per cent sodium sulphate, and between 1.5 to 6 per cent calcium carbonate. The toxic point for magnesium sulphate was not determined. Nitrification in alkali soil was increased by small amounts of sodium bicarbonate, sodium carbonate, and calcium carbonate. Calcium sulphate had no effect. These salts became toxic in this soil at 0.3 per cent for both the sodium carbonate and bicarbonate and at 6 per cent for the calcium carbonate. The addition of calcium sulphate with the sodium carbonate and bicarbonate, in the proper amount to react with them, prevented any toxic effect from the largest amount used.

"The tests in the greenhouse soils checked very closely with the laboratory studies in the case of the alkali soils. In the normal soils the agreement was likewise good, except in the case of sodium sulphate. That salt became toxic according to these tests at a concentration of 0.5 per cent. This is a very much lower toxic point than was noted above but nearer that found by others. The effects on the crop grown in normal soil of the alkali salts, with the exception of the sodium sulphate, were very similar to the effects on nitrification in both laboratory and greenhouse tests. Increases were secured with sodium chlorid, magnesium sulphate, and calcium carbonate, but sodium sulphate caused a depression in crop and in nitrification in the greenhouse soils. All the salts together had no effect. In general, it seems that nitrification and crops are very similarly affected by alkali salts.

"Crops refused to grow in the alkali soil, but the injurious factor was evidently not an excess of sodium bicarbonate or carbonate, as additions of these salts increased nitrification in the soil. The injurious factor was likewise evidently not calcium carbonate, for that compound stimulated nitrification in the alkali soil."

Reclaiming niter soil in the Grand Valley; E. P. SANDSTEN (*Colorado Sta. Bul. 235* (*1917*), *pp. 3–8, figs. 4*).—Field tests of methods for the correction and reclamation of abandoned niter land in the orchard areas of the Grand Valley of Colorado led to the conclusion that flooding gave the quickest results, especially on well-drained lands. While the corrugating system of irrigation (letting water run for 36 hours in furrows made close together after seeding the land) appeared adequate for soils in the first stages of niter poisoning, it was found to be slower and in the long run more expensive than flooding on land made unproductive by excessive niter. The results emphasize especially the necessity for good drainage in reclaiming niter soils.

It was also found that cover crops alternating with clean culture tended to check niter poisoning in bearing orchards.

Soil survey of Harnett County, N. C., R. C. JURNEY and S. O. PERKINS (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 37, fig. 1, map 1*).—This survey, made in cooperation with the North Carolina Department of Agriculture, deals with the soils of an area of 380,800 acres in the east-central part of North Carolina, lying mainly in the Coastal Plain but with part of the northwestern section of the county in the Piedmont. The topography of the county varies from flat and gently undulating to rolling, hilly, and broken. The area is well drained with the exception of the flatwoods section and some of the first bottom lands.

The soils of the county are derived from unconsolidated sands and clays of sedimentary origin in the Coastal Plain section and from igneous and

metamorphic rocks, chiefly mica schist, gneiss, granite, and slate in the Piedmont Plateau section. Twenty-four soil types of 13 series are mapped in addition to swamp, gravel hills, and rock outcrop. Norfolk sand and Norfolk sandy loam predominate, occupying 26.2 and 19.4 per cent of the area of the county, respectively.

Reconnoissance soil survey of south part of north-central Wisconsin, W. J. Geib, A. E. Taylor, J. B. R. Dickey, C. Thompson, T. J. Dunnewald, and C. B. Post (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1915, pp. 65, pls. 4, figs. 2, map 1*).—This survey, made in cooperation with the State of Wisconsin, deals with the soils of an area of approximately 2,985,600 acres in the south part of north-central Wisconsin, comprising Taylor, Lincoln, Clark, and Marathon Counties. A general report and map of this area has already been noted (E. S. R., 16, p. 27).

The topography of the northern and eastern parts of the area ranges from level to rough and broken, while over the remainder of the area the slopes are long and gentle and there are few lakes and swamps. The soils of the area are of glacial origin, although the periods of glaciation which influenced the regions were separated by long periods of time. Twenty-four soil types of 8 series are mapped in addition to areas of peat and rough, stony land, Spencer silt loam and Gloucester silt loam occupying 44.8 and 14.3 per cent of the area, respectively, predominating.

The composition of the soils of south-central Texas, G. S. Fraps (*Texas Sta. Bul. 213 (1917), pp. 48*).—This bulletin reports chemical analyses of samples of soil from an area comprising 19 counties in south-central Texas, previously described and mapped by the U. S. Department of Agriculture (E. S. R., 34, p. 213). Analyses of the surface and subsoils of the various soil types found in the area are tabulated in a comparison of the soils by counties. An interpretation of the analyses with reference to plant food deficiencies is given.

"Black alkali" in the San Luis Valley, W. P. Headden (*Colorado Sta. Bul. 231 (1917), pp. 3–15*).—Reviewing certain factors thought to be largely responsible for the almost complete loss of fertility of an area of from 400,000 to 500,000 acres in the San Luis Valley of Colorado, and based upon his own observations, the author concludes that so-called black alkali, composed largely of sodium carbonate, is the primary cause of the barren soils. The waters of the valley, including the rivers and artesian wells, are carriers of the carbonate, and the practice of subirrigation has brought the alkali to the surface by capillarity and evaporation. The presence of white alkali, mostly sodium sulphate, even in large quantities, and of nitrates, although the latter are sometimes present in sufficient quantities to inhibit growth, are deemed of secondary importance as compared with the black alkali. The maintenance of a high-water plane (22 to 12 in. from the surface), due to subirrigation, as a contributing factor to low production, is also thought to be relatively unimportant, since good crops are produced by subirrigation in other regions. By actual analyses the soils of the valley were found to be fairly well supplied with the more essential plant food elements.

It is suggested that the remedy lies in a conversion of the carbonates into sulphates by the use of a sufficient amount of gypsum, for all practical purposes about 9 lbs. of gypsum to 1 lb. of black alkali, and downward washing by means of surface irrigation with furrows or by flooding. While some drainage is deemed necessary to reclaim parts of this area, it is still regarded as an open question as to the benefits to be expected from large systems aiming to drain the whole section.

[Progress report of soil and fertilizer work in Rhode Island], B. L. HARTWELL (*Bul. R. I. State Col., 12* (*1917*), *No. 4, pp. 18–23*).—This briefly reviews the progress during 1916 of investigations relating to vegetable matter for the soil, the efficiency of manures, the neutralization of sour soils, and specific plant differences and needs.

Food from the air, H. LEFFMANN (*Trans. Wagner Free Inst. Sci. Phila., 8* (*1917*), *pp. 1–14, figs. 4*).—This is a description of the processes of fixation of atmospheric nitrogen by oxidation, by absorption, and as ammonia. A bibliography of recent literature on the subject is appended.

The fixation of nitrogen in feces, E. H. RICHARDS (*Jour. Agr. Sci.* [*England*], *8* (*1917*), *No. 3, pp. 299–311, figs. 2*).—Experiments conducted at the Rothamsted Experiment Station with horse and cow manure are reported.

It was found that "horse feces contain material capable of fixing nitrogen when fermented aerobically in presence of sufficient moisture and calcium carbonate. This fixation is a function of the diet, for when horses are fed on grass alone instead of corn and hay the amount of nitrogen fixed is much reduced. Under the most favorable conditions 1 gm. of dry matter in the feces will fix 4 mg. of nitrogen. Bullock feces will also fix nitrogen but to a much smaller extent than horse feces. This is also a function of the diet as it only occurs when the animals are fed with cake. On grass alone no nitrogen is fixed.

"The organisms concerned in the fixation of nitrogen are present in garden soil. Evidence is adduced to show that fixation is brought about by a mixed culture of Azotobacter and *Bacillus lactis ærogenes*. Of these the latter is normally present in feces; Azotobacter is not, but readily infects feces. Both organisms are present in the soil used and will fix nitrogen in raw feces but not in sterile feces."

The availability of phosphoric acid in rock phosphate, G. S. FRAPS (*Texas Sta. Bul. 212* (*1917*), *pp. 40*).—The results of numerous pot experiments to determine the percentage of added phosphoric acid recovered in the crops grown upon a soil are reported in detail and previous investigations by the author on the subject are reviewed (E. S. R., 23, p. 423; 34, p. 421.) Detailed data are given for recovery of phosphoric acid by crops from acid phosphate and rock phosphate and the effect of manure upon the recovery.

"The average recovery of phosphoric acid on 25 pot experiments for several crops is 48.2±2.2 per cent. The average recovery in 22 experiments for the first crop is 30.6, compared with 47.3 per cent for all the crops. The average quantity of phosphoric acid removed from manure in 22 experiments is 39.2 per cent, compared with 37.9 for acid phosphate in the same series. The manure has probably made some phosphoric acid of the soil available. The average recovery from acid phosphate when used with manure is less than for the acid phosphate used alone, perhaps due to the supply exceeding the needs of the plants in some of the tests. The average recovery of phosphoric acid from rock phosphate in 21 experiments is 9.1±1.1, compared with 43.9±2.3 for acid phosphate in the same experiment. Thus the phosphoric acid in rock phosphate had about one-fifth the availability of that in acid phosphate in these tests, in which several crops were grown.

"There are very decided variations in the value of rock phosphate in different soils. If the first crops grown are considered, and no others, phosphoric acid of acid phosphate has about six times the availability of that in rock phosphate. In 19 pot experiments the recovery of phosphoric acid from rock phosphate alone was 9.6±1.3 per cent, and for rock phosphate with manure it was 8.6±1.2 per cent after correction for the phosphoric acid removed from the ma-

nure alone. The manure had no effect upon the assimilation of phosphoric acid from rock phosphate in these experiments."

Acid phosphate v. raw phosphate rock, C. E. THORNE (*Mo. Bul. Ohio Sta., 2 (1917), No. 11, pp. 350–356, figs. 3*).—Reviewing the results of fertilizer experiments at Strongsville (E. S. R., 36, p. 820) during the past 13 years, in a comparison of the effects of raw rock phosphate and acid phosphate used alone and in combination with lime and other fertilizing materials upon the wheat crop in a rotation of corn, oats, wheat, clover, and timothy, it was found that the 5,000 lbs. of rock phosphate used during the 13 years returned more than three times its cost in increased yields, and that the 960 lbs. of acid phosphate used returned more than ten times its cost. It was concluded, therefore, that "it is not a question whether rock phosphate may be used with profit, but merely one of relative profit."

Reactions of the phosphorus of the thickened root of the flat turnip, B. L. HARTWELL, F. S. HAMMETT, and P. H. WESSELS (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 8, pp. 359–370*).—Previous investigations at the Rhode Island Experiment Station (E. S. R., 29, p. 417) have shown that the percentage of total phosphorus in flat turnip roots (*Brassica rapa*) grown in different soils generally varied in the same direction as variations in the amount of phosphorus available to the plant. Further investigations were undertaken to ascertain whether the amount of any portion of the phosphorus of the turnip root might be more nearly correlated than total phosphorus with the relative amount available in soils.

Preliminary studies indicated that larger amounts of phosphorus could be extracted from fresh than from dried material. Microchemical examinations of turnip roots grown in culture solutions with and without phosphorus and chemical examinations of turnip extracts are discussed, together with results of dialysis of the extracts. The results are summarized as follows: "Coincident with the introduction of phosphorus into a nutrient solution in which turnips were growing, the appearance of 'inorganic' phosphorus and the disappearance of starch were traced microscopically in the different tissues; whereas upon withholding phosphorus the disappearance of inorganic phosphorus and the appearance of starch were similarly observed. About four-fifths of the total phosphorus of fresh turnips was extracted with water. When the latter was acidulated, somewhat less was secured because of partial precipitation.

"Only a few per cent of the extracted phosphorus failed to pass through dialyzers. Different precipitants of inorganic phosphorus were tested as to their ability to recover phosphate added in a standard solution to the dialyzates. The phosphorus in the precipitate formed by adding acetic acid to turnip juice was not in phosphoprotein compounds. There was no phytin in the juice. The presence of a phosphatase was not shown.

"Although the proportion of inorganic to total phosphorus in turnips was frequently made larger by phosphatic applications to the soil in which they were grown, this was not always shown to be the case by such methods as were used. In most instances the phosphorus in the juice was so largely inorganic and constituted so large a proportion of the total that the determination of the latter seemed about as useful as of any portion for furnishing indications regarding the relative amount of soil phosphorus at the disposal of the turnip."

A list of references to literature on the subject is given.

Potash in 1916, H. S. GALE (*U. S. Geol. Survey, Min. Resources U. S., 1916, pt. 2, pp. V+73–171, figs. 2*).—This report, dealing with the production of potash in 1916 and developments and projects therefor in the United States, states that "the manufacturers of potash salts and potash products in the United

States reported a production in 1916 of 35,739 short tons, having a mean content of about 27 per cent potash (K_2O) and a total content of 9,720 short tons of potash (K_2O). This is almost exactly ten times the production reported for 1915." The reports for all forms are reduced to tons of available potash in the following table:

Summary of potash produced in 1916.

Source.	Available potash (K_2O).	
	Quantity.	Value at point of shipment.
	Short tons.	
Natural salts or brines	3,994	$1,937,600
Alunite and silicate rocks, including recoveries through furnace dust	1,850	715,000
Kelp	1,556	781,100
Wood ashes (potashes, pearlash)	412	270,000
Distillery waste (molasses)	1,845	500,900
Miscellaneous organic sources	63	38,130
	9,720	4,242,730

"The largest output has come from the alkali lakes in western Nebraska, which have afforded the most readily available supply of moderately high-grade potash salts obtained by direct drying of the raw material, with perhaps as few technical complications as could be involved in any chemical operation. The great deposit at Searles Lake is only just being brought to the producing stage, the project there having undergone many reverses, technical and otherwise. The production from alunite has been rather regular, but has shown little expansion. Some progress has been made in the extraction of potash from silicates, at least one plant having made and marketed a special product. A large quantity of feldspar has been mined, ground, and so treated that a small percentage of its potash was rendered soluble and so available for use in fertilizers, but none of it is included in the figures for 1916, as little of it was marketed in that year. So far as known, no leucite rocks or mica or sericite schists or similar rocks having a large content of potash have yet yielded any commercial water-soluble salts.

"Potash has been produced from several kinds of organic materials. The efforts to obtain potash and potash fertilizers from kelp have been widely published and have been to a certain extent successful. High-grade potash fertilizer salts have been made from molasses distillery wastes in quantities that exceeded the production from kelp. The manufacture of potash from wood ashes by the old-time methods continues to make a small but significant contribution to the total production."

The divergent effects of lime and magnesia upon the conservation of soil sulphur, W. H. MacIntire, L. G. Willis, and W. A. Holding (*Soil Sci., 4 (1917), No. 3, pp. 231–237, figs. 2*).—Experiments at the Tennessee Experiment Station with a mellow sandy loam soil are reported, in which burnt lime, burnt magnesia, precipitated calcium carbonate, precipitated magnesium carbonate, 100-mesh limestone, 100-mesh dolomite, and 100-mesh magnesite were added to the soil at rates equivalent to 8, 32, and 100 tons of calcium oxid per acre. Each treatment was thoroughly mixed with moist soil in good, workable condition and placed in a galvanized iron lysimeter containing a sand filter bed and having a block tin drainage tube. In a second set, placed simultaneously, the foregoing treatments were duplicated as to surface soil, but 1 ft. of clay subsoil was placed between each sand filter and the overlying surface soil.

During the first year the loss of sulphur was very much heavier from the tanks containing only surface soil than from the tanks which contained subsoil also. As a rule the same held for the second year except where the oxid and precipitated carbonate of magnesium were applied. The averages of the total amounts of SO_3 leached from all the tanks receiving the several carbonates were 472 lbs. and 221 lbs. per acre, respectively, for the years 1914–15 and 1915–16, in the case of the tanks having no subsoil, as compared with 31.1 lbs. and 114.8 lbs. per acre, respectively, for the identically treated tanks during the same two years where the surface soil was underlaid with 1 ft. of clay subsoil. Analyses of the leachings established the fact that the downward movement of sulphur and that of magnesium were parallel.

The 8-ton applications of burnt lime slightly depressed the amounts of sulphur coming through in the leachings, as compared with the other and equivalent treatments, while the 32-ton and 100-ton treatments practically inhibited the outward movement of sulphur in solution. No such retardation in the sulphate leachings was demonstrated by the precipitated carbonate or by the natural carbonate of lime, even in the case of the 100-ton equivalent applications. During the second year, when the 32-ton treatment of lime had become in large part carbonated, the increase in the sulphates leached was over sixfold. The effect of oxid of magnesium was the reverse of that produced by burnt lime. All of the natural carbonates in the several amounts appeared to bring about conditions which caused an augmented outgo of SO_3 when compared with subsoil tanks which received no carbonate treatment.

See a previous note related to the subject (E. S. R., 31, p. 815).

Accessory factors for plant growth, O. ROSENHEIM (*Biochem. Jour., 11 (1917), No. 1, pp. 7–10, pl. 1*).—Experiments with water extract of bacterized peat are reported. The results are taken to indicate that the action of the extracts on plant growth demonstrated the presence of substances similar to the vitamins in their general behavior.

Analysis of fertilizers for 1917, B. E. CURRY and T. O. SMITH (*New Hampshire Sta. Bul. 185 (1917), pp. 11*).—This bulletin reports the guaranteed and actual analyses of 165 official samples of commercial fertilizers and fertilizing materials collected and analyzed in 1917.

Commercial fertilizers in 1916–17, G. S. FRAPS (*Texas Sta. Bul. 217 (1917), pp. 26*).—This bulletin reports the guaranteed and actual analyses of commercial fertilizers and fertilizing materials for the season of 1916–17, together with a list of the brands registered for sale during the season.

It is stated that the results of numerous chemical analyses, pot tests, and field experiments on Texas soils make it "evident that Texas farmers can well afford to eliminate potash from general fertilizers, especially for cotton and corn. . . . In the majority of cases potash is not needed, being supplied by the soil in sufficient quantity. . . . Texas soils can get on much better without any addition of potash than without phosphoric acid or nitrogen. . . . The present prices of potash are much too high to warrant its use as a fertilizer."

AGRICULTURAL BOTANY.

The methods and value of cytology, A. GUILLIERMOND (*Rev. Gén. Sci., 28 (1917), Nos. 6, pp. 166–174, figs. 7; 7, pp. 208–216, figs. 9*).—A discussion is given of the various fixation methods and of their values, which are compared respectively with the methods of study of the living cell and with the particular or relative values of such studies. Some of the author's investigations on the relation between the appearance and activities of mitochondria and their

functions as related to such substances as starch, oils, and coloring matters are also discussed.

A study of the fixation of the cytoplasm, A. Guilliermond (*Compt. Rend. Acad. Sci. [Paris], 164 (1917), No. 17, pp. 643–647*).—The author describes a method which is claimed to produce as nearly perfect fixation of cytoplasm as is possible to obtain. He states that in a drop of 3 per cent acetic acid the mitochondria of epidermal cells of Tulip immediately assume a vesicular appearance, while in one of 5 per cent strength the chondriome is almost entirely dissolved at once. The mitochondria appear to be the least resistant of the cellular elements, the most difficult of fixation, and particularly subject to injury in osmotic changes.

The presence of lipoids in Nicotiana as related to starch and nicotin, A. Parrozzani (*Rend. e Mem. R. Accad. Sci., Let. ed Arti Zelanti Acireale, 3. ser., 7–8 (1912–1915), pp. 35–56*).—A study of lipoids in young and in adult plants of several species of Nicotiana is said to support the findings of Buscalioni (E. S. R., 31, p. 427) in this respect, lipoids being often found in the chloroplasts of the leaves of adult plants and being more abundant in the older basal leaves than in those toward the apical regions, as also in the lower portions of the stems. Lipoids are almost lacking in very young plants. Starch occurs in a way somewhat paralleling the occurrence of lipoids as regards the stems and the age of the plants, but it disappears from the marginal and some other portions which, in leaves higher up, show a quantity greater than is usual. Details are given of the relative abundance of these and other substances in the various portions of the plant at different ages.

Carbon [assimilation] in green plants, G. Pollacci (*Atti Ist. Bot. R. Univ. Pavia, 2. ser., 17 (1917), pp. 29–51, figs. 2*).—The studies previously noted (E. S. R., 29, p. 28; 35, p. 435) having been continued with different plants, the author observed an increase of weight in those from which atmospheric air was excluded with the exception of the roots. It is concluded from this that the roots of such plants are able to appropriate carbon dioxid from the atmosphere and utilize it in their development.

Report of the bacteriologist, M. Mulvania (*Tennessee Sta. Rpt. 1913, pp. 159–161*).—This is a brief progress report on studies of the ability of bacteria to produce humus from definite forms of organic matter, such as cottonseed meal, ground straw, and cow dung, and of the influence of humus on nitrogen-assimilating bacteria (Azotobacter), employing certain modifications of methods previously described (E. S. R., 28, p. 727).

Humification was found to proceed in direct proportion to the amount of organic matter present, but the sterilized flasks always gave as much humus as those inoculated with bacteria and often more. Sterilization slightly decreased the extractable matter. There was a decided loss of nitrogen from the inoculated flasks. It was concluded that "under the conditions maintained organic matter in the inoculated flasks is decomposed, nitrogen is liberated, but humus is not produced."

Present methods are not deemed adequate for a study of the effect of humus upon nitrogen assimiliation by Azotobacter. The associative action of Azotobacter, *Bacillus radicicola*, and *B. subtilis* in nitrogen fixation was observed to add more nitrogen to the mannite solution than when these microorganisms worked in any other combination.

The influence of water and of mineral matters on the development of plantlets, L. Maquenne and E. Demoussy (*Compt. Rend. Acad. Sci. [Paris], 164 (1917), No. 26, pp. 979–985*).—The lowering of the growth rate of pea seedlings when sprouted in the purest water obtainable is thought to result from the absence of the very minute quantities of material commonly dissolved out of

the containers, more particularly while the water is warm, calcium being apparently the sole or chief constituent which is influential in this connection.

The influence of calcium salts on absorbing root hairs, H. Coupin (*Compt. Rend. Acad. Sci.* [*Paris*], *164* (*1917*), *No. 17, pp. 641–643*).—*Lepidium sativum* was exposed, after germination in tap water, to varying solutions of calcium sulphate, carbonate, nitrate, or chlorid. It was found that the growth of the root hairs was inhibited by the last three of these calcium compounds.

The use of perphosphates in agriculture, N. A. Barbieri (*Gaz. Chim. Ital.*, *47* (*1917*), *I, No. 1, pp. 38–51*).—It is stated that all the phosphorus contained in animals or plants is in the form of soluble or insoluble phosphates. Plants do not yield nor will they absorb monocalcium or dicalcium phosphate, these substances arresting germination of the seed or development of the plant. Cereals or legumes from soils furnished with perphosphates contain less total phosphorus than do those from neighboring soils lacking perphosphates. Perphosphates may kill seeds with which they come into direct contact.

Studies in greenhouse fumigation with hydrocyanic acid: Physiological effects on the plant, W. Moore and J. J. Willaman (*U. S. Dept. Agr., Jour. Agr. Research, 11* (*1917*), *No. 7, pp. 319–338, pl. 1, figs. 11*).—In continuation of investigations previously reported (E. S. R., 38, p. 158), the authors have conducted a study to determine the action of hydrocyanic acid gas on the tissues of the plant. All of the investigations have been conducted at the Minnesota Experiment Station.

It has been found that plants subjected to hydrocyanic acid fumigation absorb more or less of the gas, the immediate effect of the poison being a reduction in the activity of the oxidases and catalase and hence in respiratory activity. Following this action, there is an inhibition of photosynthesis and translocation of carbohydrate and a closing of the stomata. The permeability of the leaf septa is said to be increased and this causes less rapid intake of water from the stems and more rapid cuticular transpiration. In mild cases this may result in merely a temporary wilting, while in more severe fumigations the wilting is followed by disintegration and death of the tissues. The authors claim that the primary effect of the presence of hydrocyanic acid in a plant is a disturbance of the oxidase and catalase activities, all other physiological effects being secondary to this.

The physical control of vegetation in rain-forest and desert mountains, F. Shreve (*Plant World, 20* (*1917*), *No. 5, pp. 135–141*).—The purpose of this paper is to bring out some of the contrasts between the manner of control of vegetation by conditions in the humid mountains of a tropical island and that in the arid mountains of a temperate continental region. The basal details are to be found in the author's publications previously noted (E. S. R., 32, p. 748; 36, p. 27).

Calling attention to instances illustrating the fact that two mountain ranges may differ greatly in flora while having practically identical controlling environmental factors, the author shows that the actual factors which underlie the topographic control of the vegetation in the desert mountains of Arizona and those in the Blue Mountains of Jamaica are diametrically opposed.

Critical flowering and fruiting temperatures for Phytolacca decandra, F. E. Lloyd (*Plant World, 20* (*1917*), *No. 4, pp. 121–126*).—The author has made observations on pokeweed in two diverse climates widely different from that of its native habitat for several years, during which time it produced seed only under certain exceptionally favorable circumstances at Carmel, Cal. He concludes that if the prevailing day temperatures, which are normally low enough to prevent reproduction by the seed, were 5° warmer during the warmest hours

of the day, the species would be able to perpetuate itself in this locality by means of seed.

Modifications produced by sea winds in the male inflorescences of pine, J. DUFRÉNOY (*Compt. Rend. Soc. Biol. [Paris], 80 (1917), No. 4, pp. 174, 175*).—The author notes the occurence, in pines exposed to sea winds, of a curving of the male inflorescence with other alterations which are detailed, also of other modifications apparently supporting the view that ecological conditions may cause the development of rudimentary branches into structures which may be reproductive, assimilative, or multiplicative in their functions.

The bacteriological study of natural coagulation in latex of Hevea brasiliensis, DENIER and G. VERNET (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 3, pp. 123–126*).—Hevea latex, which has when first collected a milk-white color and corpuscles showing the Brownian motion, is at that time almost free from bacteria. These, however, soon develop abundantly. The author noted the presence of organisms, both aerobic and anaerobic, in latex. One is described in some detail as to its characters and influence on coagulation, which it is said to accomplish in 24 hours. Suggestions are given regarding conditions favorable to the coagulation of latex.

Sexuality in Myxomycetes, F. X. SKUPIENSKI (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 3, pp. 118–121*).—The author describes observations claimed to show that a marked sexuality exists in *Didymium nigripes*.

Parthenogenesis in higher plants, A. C. HAGEDOORN-LA BRAND and A. L. HAGEDOORN (*Teysmannia, 27 (1917), No. 11–12, pp. 643–656, pl. 1*).—An account is given of the crossing of cucurbits said to have been produced from seed without pollination with those from hybrid plants. The results, though vitiated in some degree by failure ascribed to external causes, suggest some noted by Honing (E. S. R., 32, p. 520; 33, p. 644). It is recommended that in cases where exceptional results are obtained in the progeny of hybrids, investigations be carried out to determine how far partial parthenogenesis or partial apogamy in the ancestors may be responsible for the anomaly.

Quadruple hybrids in the F_1 generation from Œnothera nutans and Œ. pycnocarpa, with the F_2 generations, and back crosses and intercrosses, G. F. ATKINSON (*Genetics, 2 (1917), No. 3, pp. 213–260, figs. 16*).—In continuance of a partial report previously made (E. S. R., 30, p. 730) regarding studies on the results of crosses made with *Œ. nutans* and subsequent studies on crossings of the descendants of these hybrids, the author states that in the F_1 generation of the cross *Œ. nutans*×*Œ. pycnocarpa* four hybrid types appeared which have been named, respectively, *Œ. hybrida nutella*, *Œ. hybrida pycnella*, *Œ. hybrida tortuosa*, and *Œ. hybrida tortuella*. In the F_1 generation of the reciprocal cross three hybrids have been obtained which appear to be identical with the first three above named, and it is thought that the fourth might appear if the crossings were sufficiently numerous.

Œ. hybrida nutella is a blend hybrid. *Œ. hybrida pycnella* and *Œ. hybrida tortuosa* are selective hybrids and are physiological homozygotes, being fixed in the F_1 generation and, when selfed, repeating in the F_2 and succeeding generations. They are regarded as examples of permanent or stable dominance of factors. *Œ. hybrida tortuella*, also a selective hybrid, is not fixed in the F_1. When selfed it dissolves in the F_2 into numerous types, some of which are considered as showing that certain factors are activated in this generation which were subordinate in F_1.

The production of four hybrid types in the F_1 is considered as an example of multiple dominance. In back crosses there appear five cases of patrocliny with ten cases of splitting into two types and four of splitting into three types. In the intercrosses there are two cases of patrocliny, three of splitting into two,

one of splitting into three, and one of splitting into four types. In the intercrosses and back crosses no new types appear except a dwarf form referred to *Œ. gracilis*. Evidence is summarized which is considered to indicate that the gametes in *Œ. hybrida nutans* and *Œ. hybrida pycnocarpa* are uniform.

Inheritance of a mosaic pericarp pattern color of maize, H. K. Hayes (*Genetics, 2 (1917), No. 3, pp. 261–281, fig. 1*).—The author describes experiments carried out with a mosaic pericarp pattern color in maize, employing the progeny of an ear found in the course of work done with East as previously noted (E. S. R., 25, p. 736), which had on one side seeds with a red pericarp and on the other seeds which were white or had but a narrow red stripe.

The first two years of the experiment showed all degrees of variation from dark, heavily striped ears to ears with colorless pericarp. Later selection experiments gave results showing the usual type of Mendelian inheritance, along with some which are not easily explainable by the hypothesis of the absolute purity of fundamental inheritance factors.

Self-fertilization and selection isolated several types which bred relatively true. The self-red, pattern, and colorless selections appear to be homozygous for these characters, the variegated selection proving to be homozygous for the mosaic character and giving ears ranging from heavy striation of nearly all seeds to striation of only a few seeds.

The relation of the various pericarp characters was studied, and it is suggested that certain combinations produce germinal instability. The conclusion is reached that the factors for self-red, variegated, pattern, and colorless pericarp form a series of multiple allelomorphs.

The hybrid origin of alfalfa, L. Trabut (*Compt. Rend. Acad. Sci. [Paris], 164 (1917), No. 16, pp. 607–609*).—The author offers what is held to be sufficient evidence to show that *Medicago sativa* has arisen by hybridization from the two primitive species *M. falcata* and *M. getula*, the last named being synonymous with *M. cœrulea*, *M. contorta*, and *M. tunetana*.

Origin, introduction, and primitive culture of the potato, W. F. Wight (*Proc. Potato Assoc. Amer., 3 (1916), pp. 35–49*).—The author gives the results of a study of early and recent accounts of the cultivated potato and of his personal search, chiefly in South America, for the original wild form of *Solanum tuberosum*. He also gives considerable information of a related but somewhat miscellaneous character regarding the potato plant.

It is stated that many of the wild species so resemble the cultivated forms (so far as superficial foliage characters are concerned) that persons very familiar with the latter have often been deceived. In every case, however, which the author has fully investigated the plant has proved to be some other species, and after a century and a half of intermittent collecting there is nowhere known to be evidence showing conclusively that the species is now growing indigenously anywhere in its original condition.

It is stated that throughout a large portion of these potato-growing regions the differences in soil and climate conditions are very great. The number of potato varieties to be found is large and constantly increasing, some appearing to be very persistent.

Forest botany [India], R. S. Hole (*Ann. Rpt. Bd. Sci. Advice India, 1915–16, pp. 100–102*).—A brief account is given of studies or observations on the ecology of sal (*Shorea robusta*); remedies for defective reproduction by sal; root disease (*Polyporus shoreæ*) of sal trees; the ecology of teak; *Trametes pini* as a cause of disease induced by lopping *Pinus excelsa;* and on the forest floras of the central provinces. A list of recent publications is included.

FIELD CROPS.

[Report of the agronomy department, Montana Experiment Station], A. ATKINSON (*Montana Sta. Rpt. 1916, pp. 165–170*).—This reports the results of variety tests with winter and spring wheat, oats, barley, annual hay and pasture crops, and root crops; cultural tests with peas; a comparison of continuous and alternate cropping on dry land; and a comparison of wheat alternating with bare fallow with wheat alternating with corn.

Kharkov winter wheat, with an average yield of 35.7 bu. per acre, has given the best results on dry land. Among the spring wheat varieties grown under dry-land conditions Pelissier has given the highest yield for a 7-year period, averaging 27.2 bu. per acre. Ghirka and Fife, good milling varieties, averaged 23.7 and 23.1 bu. per acre, respectively, for the same period, while Marquis gave a 3-year average yield of 33.1 bu. per acre and is deemed one of the best varieties for dry land. Under irrigation the highest yielding spring wheat was Stanley, with a 7-year average yield of 68.5 bu. per acre, but it possessed poor milling quality. Of the milling varieties, Scotch Fife and Marquis have given average yields of 63.3 and 52.4 bu. per acre, respectively. Purple Durum and Gharnovka, macaroni varieties, have averaged 65.3 and 62.6 bu. per acre, respectively, under irrigation.

The leading oat varieties under irrigation included No. 72, with an average yield of 119.4 bu. per acre, Myrick, with 114.9 bu., Silver Mine, with 113.9 bu., No. 10624, with 110.1 bu., and Banner, with 109.6 bu., all outyielding Swedish Select, the prevailing variety grown in the State. On dry land Sixty Day has given the highest average yield, 62.4 bu. per acre, while Swedish Select averaged 46.5 bu.

Among barley varieties grown under irrigation, New Zealand was first with an 8-year average yield of 86.1 bu. and Guy Mayle second with 67.8 bu. per acre. Oderbrucker has averaged 86.5 bu. for a 4-year period. White Smyrna, with a 5-year average yield of 52.9 bu. per acre, was first of the barley varieties grown on dry land.

Annual hay crops grown under irrigation included the following, with their respective yields of cured hay: Foxtail millet, 4.3 tons; Sudan grass, 3.8 tons; billion-dollar grass, 5.3 tons; vetch, 4.73 tons; and Johnson grass, 1.6 tons. Promising pasture crops tested under irrigation, with their yields in green weight per acre, were Dwarf Essex rape, which averaged 26 tons, and Thousand-Headed kale, which averaged 29.5 tons.

Root crops grown under irrigation for the past 3 years gave the following average acre yields: Mammoth Long Red mangles, 37.6 tons; Yellow Globe mangles, 30.1 tons; Giant Feed half-sugar beets, 19.7 tons; sugar beets, 13.5 tons; field carrots, 16.4 tons; field turnips, 20.5 tons; and Monarch rutabagas, 16.3 tons.

In a comparison of continuous and alternate cropping on dry land the following average results have been secured over a 6-year period:

Average yields obtained from continuous and alternate cropping on dry land for a 6-year period.

Crop.	Yield per acre.		
	Grown continuously.	Alternate crop and fallow.	Alternate crop and fallow. Manure applied to the fallow.
	Bushels.	*Bushels.*	*Bushels.*
Fall wheat	28.72	46.78	47.96
Spring wheat	23.11	37.83	39.55
Oats	55.69	71.76	71.77
Barley	35.68	49.44	49.94

Wheat alternated with bare fallow in comparison with wheat alternated with corn resulted in estimated average profits per acre of $6.89 with wheat and corn and $2.37 with wheat and fallow for a 7-year period at the Judith Basin substation. At the Huntley substation the average profits per acre over a 4-year period were estimated to be $9.05 for wheat and corn and $3.70 for wheat and fallow.

Field peas sown in drill rows 8 in. apart and in 24-in. rows, using 3 bu. of seed per acre, have given average yields of 44 and 42 bu. per acre, respectively, for the past 5 years. Plantings in 24-in. rows, using 1.5 bu. of seed, yielded 35.6 bu. per acre, while 36-in. rows have averaged from 30.3 to 36 bu. per acre.

[Field crops work in Tennessee] (*Tennessee Sta. Rpt. 1914, pp. 269–271, 277–279*).—Reviewing the progress of work with field crops for 1914, brief notes are presented on cultural tests with red clover, alfalfa, cowpeas, wheat, and corn; on field tests with Sudan grass, honey sorghum, cotton, winter beardless barley, sweet clover, and smooth-headed millet; and on the value of the subsoil plow for Tennessee conditions.

Progress report, Substation No. 5, Temple, Tex., 1910–1914, D. T. Killough (*Texas Sta. Bul. 215 (1917), pp. 3–28, figs. 8*).—This bulletin reports results of testing, improvement, and production studies with cotton, cowpeas, soy beans, Sudan grass, corn, and the grain and forage sorghums, together with rotation experiments and field tests comparing different methods of soil preparation. Attempts to establish satisfactory fruit, truck, and garden crops on the substation are briefly noted.

Data on rainfall from 1889 to 1914, inclusive, are presented, the annual precipitation varying from 20.45 to 59.28 in. with an average annual rainfall of 35.07 in. The summer months of 1912, 1913, and 1914 were especially dry, although the total annual precipitations amounted to 29.41, 43.65, and 46.74 in., respectively. Weather conditions were deemed more satisfactory for cotton than for corn.

Rotation tests with cotton resulted in yields amounting to 849.87 lbs. of seed cotton per acre for cotton grown in rotation and 522.9 lbs. for cotton following cotton. Similar tests with corn resulted in yields of 25.6 bu. per acre for corn grown in rotation and 17 bu. for corn following corn. Observations on the root rot disease, *Ozonium omnivorum*, of cotton in 1914 revealed the fact that a loss of 59 per cent was sustained from this disease by cotton grown on land continuously cropped to cotton, whereas in a 4-year rotation a loss of only 0.6 per cent occurred.

Leading cotton varieties in tests conducted during 1912–1914, inclusive, included Union Big Boll, Lone Star, and Mortgage Lifter, with average yields of lint cotton of 339.82, 339.39, and 317.34 lbs. per acre, respectively.

Variety tests with cowpeas for seed for the period of 1912–1914, inclusive, resulted in average yields ranging from 50.23 lbs. per acre for Peerless to 404.25 lbs. for New Era. Cowpea variety tests for forage in 1912 resulted in yields ranging from 966 lbs. of cured hay per acre for Peerless to 3,476 lbs. each for Iron and Clay.

Soy bean variety tests conducted from 1912–1914, inclusive, gave average yields of seed ranging from 1 bu. per acre for Jet to 3.9 bu. for Meyer.

Satisfactory yields of grain are said to have been obtained with the sorghums, especially feterita which is deemed to have its greatest value as a catch crop. Of the saccharin sorghums tested Sumac has given uniformly better yields of forage and hay. Sorghums and cowpeas grown together for hay in 1912 indicated that better results could be obtained by growing the crops separately and mixing the hay when feeding. Sumac sorghum gave better results than Amber for such mixtures, while there appeared to be no prefer-

ence among the cowpea varieties tested. A planting rate of 20 lbs. of seed per acre consisting of 1 part cowpeas and 8 parts sorghum gave a yield of 8,350 lbs. of cured hay per acre.

In corn variety tests conducted during 1913 and 1914 Surecropper, Mammoth White, and Cater were the leading varieties, with average yields of 33.87, 31.74, and 31.09 bu. per acre, respectively. Ear-to-row testing to determine the relation between certain characters of corn and yield is held to indicate that seed corn should be selected from a good stand of tall, leafy plants which are relatively heavily stalked and that large, heavy ears with deep grains should be chosen.

Corn grown in rows 3 ft. apart, with the plants spaced 30, from 30 to 40, and from 70 to 80 in. apart in the row, gave average yields of 18.91, 24.23, and 19.82 bu. per acre, respectively, for the period of 1912 to 1914, inclusive. Growing the same number of stalks of corn on the land but with different spacings between hills resulted in average yields for the period of 1913–14, inclusive, amounting to 28.32 bu. per acre for hills spaced 3 by 3 ft., 23.06 bu. for hills spaced 6 by 1.5 ft., and 22.33 bu. for hills spaced in pairs of 3-ft. rows 9 ft. apart, the stalks 18 in. apart in the row.

Corn grown alone and with cowpeas sown during the latter part of the growing period of the corn resulted in average yields of 21.68 and 20.6 bu. per acre, respectively, for the period of 1912–13, inclusive.

Field tests with various grasses have been undertaken to find a grass adapted to planting in rotation. Rhodes grass gave a yield of 3,823 lbs. of cured hay per acre in 1914, and rescue grass grown for seed yielded as high as 380 lbs. per acre. Several hybrids of Texas blue grass and Kentucky blue grass are reported as promising for this region. Sudan grass seeded broadcast at rates of 20 and 30 lbs. per acre in 1913 gave yields of 4,000 and 2,800 lbs. of cured hay per acre, respectively. Planted in 18- and 36-in. rows at a 10-lb. seeding rate, Sudan grass yielded 556 and 361 lbs. of seed per acre, and 2,950 and 2,050 lbs. of cured hay per acre, respectively. Plantings of Sudan grass in 1914 gave an average yield of 6,534.5 lbs. of forage and 147.6 lbs. of seed per acre.

The use of fertilizers and lime is said to have been less profitable on the soils of the substation than crop rotation or the use of improved crops.

October plowing for cotton in 1913 resulted in an average yield of 769.63 lbs. of seed cotton per acre as compared with 743.2 lbs. for January plowing. Depth-of-plowing tests resulted in yields of seed cotton ranging from 735 lbs. per acre for a plowing depth of 4 in. to 868.12 lbs. for a plowing depth of 12 in.

Cotton grown on land dynamited in seed bed preparation gave an average yield of 768 lbs. of cotton per acre for the period of 1913–14, inclusive, while cotton grown on land not dynamited yielded 793.7 lbs. of seed cotton. Corn grown on dynamited land in 1913 yielded 23.7 bu. per acre as compared with a yield of 25.75 bu. for corn grown on land not dynamited.

[Report of field crops work], F. WATTS (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Antigua, 1915–16, pp. 5–13, 14, 19, 20*).—Continuing work previously noted (E. S. R., 36, p. 735), variety tests are reported with sweet potatoes, cassava, eddoes and tannias, and yams for the year 1915–16.

Fertilizer and distance-of-planting tests with corn are briefly noted. A yield of 13.6 bu. of shelled corn per acre was realized from a fertilizer treatment of 30 lbs. of phosphoric acid as basic slag and 40 lbs. of potash as sulphate of potash, as compared with a yield of 6.3 bu. from the untreated check. Twelve bu. per acre were obtained from a 40-lb. application of potash as sulphate alone. Later plantings to study the residual effect of the fertilizer treatments gave a

yield of 9.2 bu. for the untreated check and 8 bu. for the phosphoric acid and potash treatment. The distance-of-planting experiments indicated that slightly higher yields were obtained from plantings of 2 by 2 ft., although the yields were not far superior to those secured from plantings of 2 by 4 ft.

Hybridization and selection work with corn and cotton is noted.

The development of the fiber industry in Antigua and the production of sisal and hemp are briefly discussed.

Plants indigenous to Chile and their production, K. Reiche (*Bol. Soc. Fomento Fabril* [*Chile*], *32* (*1915*), *Nos. 7, pp. 481–486; 10, pp. 679–684; 11, pp. 776–784; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr.*, *7* (*1916*), *No. 5, pp. 656–659*).—The most promising plants indigenous to Chile are listed, described, and their uses discussed. The species mentioned include cereals and other plants with edible seeds; tubers and roots; fiber crops; plants used for tanning; plants containing saponin; dye plants; plants containing gums and resins; medicinal plants; fruit-bearing trees and forest trees; and miscellaneous plants.

[Field experiments at the Bezenchuk Experiment Station], L. I. Koltsov (*Selsk. Khoz. i Lîesov.*, *251* (*1916*), *July, pp. 301–323*).—Method-of-sowing tests are reported with spring wheat, oats, and millet.

The best results with spring wheat were obtained from rows 5 in. apart. For oats, seeding in two rows 3.5 in. apart, with 14 in. between each pair of rows, gave the best results. Millet yielded best when sown in rows 14 in. apart. Cultivation of the intervals between the rows gave excellent results, especially with millet.

[Report of field crops work in Assam], J. W. McKay (*Ann. Rpt. Agr. Expts. Assam, 1916, pp. 7–25, 40–42, 49–60, 88–91, 104–107*).—Extensive variety and cultural tests at four experimental centers in Assam are reported with sugar cane, potatoes, corn, cotton, cowpeas (for seed and forage), and rice.

An increased yield of approximately 100.78 lbs. of grain and 191.28 lbs. of straw per acre was obtained from rice on " warped " land, a sterile marsh land reclaimed for rice cultivation and covered with a 3-in. layer of soil deposited from water.

[Report of field crops work], G. S. Henderson and G. Abdur Rahman (*Dept. Agr. Bombay, Ann. Rpt. Agr. Sta. Landhi, 1913–14, pp. 1–7; 1915–16, pp. 2–8*).—Field tests are reported for 1913–14 and 1914–15 with rotations of potatoes, the principal crop of the region, and peanuts, millet, corn, legumes (soy beans and *Dolichos lablab*), and sunn hemp used as a green manure. Other tests are noted with velvet beans, kidney beans, and green gram as forage crops, and of certain minor products such as jute, hemp, indigo, sweet potatoes, yams, and several native crops.

In 1914, of 2,000 lbs. of seed potatoes stored in wooden boxes, 240 lbs. were reported as a loss.

[Report of field crops work], H. Clayton (*Rpt. Dept. Agr. Burma, 1916, pp. 3–7*).—Field tests with rice, cotton, sesame, peanuts, castor beans, sugar cane, wheat, pigeon peas, Madagascar beans, and tobacco at the several experimental centers of Burma are reported for the year ended June 30, 1916.

[Report of field crops work at the Palur Agricultural Station], R. Thomas and J. Chelvaranga Raju (*Dept. Agr. Madras, Rpt. Palur Agr. Sta., 1914–15, pp. 2–15; 1915–16, pp. 4–25; 1916–17, pp. 26*).—Variety, rotational, and fertilizer tests with peanuts on dry and irrigated land, variety and fertilizer tests with rice, and variety tests with sugar cane are reported for 1914 to 1917, inclusive.

Continued green manuring of paddy land with daincha has resulted in a steady improvement of the land. A number of green manure crops have been

compared, indigo giving the best average results for the past eight years. Green manure supplemented by 1 cwt. of bone meal and 0.25 cwt. of potash increased the yields of rice by 426 lbs. per acre in 1916, with a similar increase of 474 lbs. in 1915 and a four-year average increase of 138 lbs.

[Report of field crops work at the Samalkota Agricultural Station], G. R. HILSON and D. BALAKRISHNAMURTI (*Dept. Agr. Madras, Rpt. Samalkota Agr. Sta., 1913–14, pp. 4–18; 1914–15, pp. 2–31; 1915–16, pp. 2–21; 1916–17, pp. 18*).—Variety, cultural, and fertilizer tests with sugar cane and rice (both wet and dry paddies) are reported for 1913 to 1917, inclusive.

Tests on limed and unlimed sugar cane plats showed an increased yield of 7,400 lbs. per acre in favor of the unlimed plat in 1916. Applications of 1,640 lbs. of castor-oil cake showed increased yields in 1915 and 1916 over applications of 10 tons of cattle manure and 820 lbs. of castor-oil cake.

Plowing the dry rice paddies resulted in increased yields of both grain and straw over the unplowed paddies. The residual effects of castor-oil cake alone and in combination with potash and acid phosphate are reported in yields of rice grain and straw for each year from 1909 to 1917, inclusive. Applications of 820 lbs. of castor-oil cake and 2 cwt. of acid phosphate appear to have given consistently higher yields than the untreated checks, whereas the castor-oil cake supplemented by 1 cwt. of potash has given yields lower than the checks. The green-manured paddy land supplemented by 2 cwt. of acid phosphate has given increased yields since 1909.

Tests with complete fertilizers supplemented by rice straw are also reported, together with their residual effects. Applications of 4 cwt. of ammonium sulphate, 2 cwt. each of acid phosphate and potassium sulphate, and 5 tons of paddy straw have shown increased yields of grain in the main crop four years out of six, and in the second crop two years out of four, over a similar fertilizer treatment without the straw. The yield of straw has been increased each year since 1911 in the main crop, and in 1914 and 1915 in the second crop by the addition of the straw.

Grasses and clovers under irrigation, J. M. PITT (*Agr. Gaz. N. S. Wales, 28 (1917), No. 2, pp. 77–82, figs. 4*).—In addition to the grasses and clovers mentioned previously by McDiarmid (E. S. R., 33, p. 228) the following are recommended as worthy of trial in establishing pastures under irrigation in New South Wales: *Lolium westerwoldicum*, *Bromus japonicus*, *Eriochloa annulata*, *Andropogon intermedius*, *Trifolium subterraneum*, *Melilotus alba*, *Medicago tuberculata*, *M. hispida*, *M. hispida sardoa*, and *M. hispida reticulata*.

Phalaris bulbosa is reported as being the most promising winter, spring, and early summer perennial yet tested. *B. inermis*, *Setaria nigrirostis*, and *Bouteloua curtipendula* gave good results, while of the native grasses previously mentioned *Panicum prolutum* and *A. sericeus* are reported as yielding large quantities of forage and seed.

The Egyptian, red, and crimson clovers again gave good results.

Effect of plants on others, B. L. HARTWELL (*Bul. R. I. State Col., 12 (1917), No. 4, p. 23*).—In 1913 buckwheat followed onions, rye, buckwheat, and redtop in the field without fertilizer, with yields amounting to 21, 21, 13, and 10 bu. per acre, respectively. The same crops were grown for two years in pots under various fertilizer treatments, and were again followed by buckwheat in 1916, resulting in yields in the same relative order as noted above.

Alsike clover sown in 1916 yielded approximately 2 tons of hay per acre after potatoes, rye, redtop, and squashes, 1.4 tons after red clover, and 1.3 tons after alsike clover itself.

Eureka silage corn sown at the rate of 15 lbs. per acre with 15 lbs. of soy beans yielded nearly as much corn as where 15 lbs. of corn were planted alone, the total yield being increased about one-sixth by the beans. Doubling the rate of seeding resulted in a decreased yield of corn scarcely compensated by the beans. It was concluded that the beans had no positive effect in increasing the nitrogen content of the corn, although that of the mixture was increased.

Berseem as a new fodder crop for India, G. S. Henderson (*Agr. Research Inst. Pusa Bul. 66 (1916), pp. 8, pls. 3; abs. in Nature* [*London*], *99 (1917), No. 2476, p. 131*).—The cultivation of berseem (*Trifolium alexandrinum*) as a forage crop in Egypt is described. The crop is usually pastured or employed as a soiling crop or for seed production. Berseem hay is said to be of excellent quality but not yet of any great economic importance.

The castor oil plant in Egypt, V. Mosséri (*Bul. Union Agr. Égypte, 15 (1917), No. 118, pp. 29*).—The cultivation of the castor oil plant (*Ricinus communis*) in Egypt is discussed in detail, and studies of the influence of soil and climate upon oil production reported.

The weight of seed and percentage of hulls and seed were found to vary with the variety, and in the same variety with the region, the season, and the crop. The physical condition of the soil is said to have less effect on the crop than excessive soil moisture or excessive alkalinity of the soil, these last-named properties affecting the weight of the seed and, to an even greater extent, the percentage of hulls and kernels.

The oil content of the seed was found to be largely dependent upon atmospheric conditions prevailing at the time of the formation and maturation of the seed, varying with the variety, the locality, the season, and the crop. The oil content was apparently increased in the same variety when the latter was transported from the north to the south and diminished with reversed conditions. It also appeared that there was a correlation between grain weight and oil content.

Ordinary white clover seed versus wild white clover seed, T. J. Jenkin (*Jour. Bd. Agr.* [*London*], *23 (1917), No. 12, pp. 1202–1208*).—Numerical data are presented and discussed in an effort to determine the real differences existing in permanent pasture formation where equal quantities of ordinary white clover and wild white clover were used. The experiments were begun in 1914 at a number of centers where permanent pastures were to be established, and observations on the percentage of area covered by white clover at the end of 18 and of 30 months reported. The seeding mixtures compared included wild white clover, ordinary white Dutch clover, and ordinary white clover. The observations briefly summarized were as follows:

Wild white clover demonstrated its superiority over ordinary white clover in most cases at about 18 months after seeding. In all cases this superiority became obvious by 30 months after seeding unless development had been checked. The average percentage of area covered by white clover 30 months after seeding was 19.7 for wild white clover, 2.13 for ordinary white Dutch, and 1.74 for ordinary white clover.

Analyses of agricultural yield.—III, The influence of natural environmental factors upon the yield of Egyptian cotton, W. L. Balls (*Phil. Trans. Roy. Soc. London, Ser. B, 208 (1917), No. 352, pp. 157–223, figs. 19*).—Supplementing an examination of the effects of such environmental factors as distance and date of planting (E. S. R., 36, pp. 36, 37) on the yield curve of Egyptian cotton, the author presents a study of the following factors: Soil fertility, hardpan (soil texture), soil depth, shortage of soil water, overwatering, root asphyxiation, weather, and climate. Statistical evidence secured from observa-

tions extending over the period of 1909–1913 and at several centers in Egypt forms the basis upon which the studies were made. The factors were studied chiefly in their effects upon the flowering curve, which represents the daily rate of flowering of an average plant, and the relation between the formation of this curve and the antecedent growth processes and subsequent yield outlined.

The flowering curve and consequently the yield curve were shown to have a typical form under good cultural conditions. Poor cultivation is defined as any condition that allows a factor to become limiting when it need not be so, thereby deforming the curve.

The differences of behavior of various cotton crops appeared to be inevitable consequences of the known environmental conditions, provided only that due regard be paid to the distinction in time between the causation of any effect and its manifestation. To denote this latter distinction the author uses the term "predetermination." Daily fluctuations of the flowering curve constitute an example of predetermination, since they are controlled by weather conditions which obtained a month before the flowers opened, and simultaneous fluctuations in the same direction may be shown by all cotton fields in Egypt.

Deductions are presented with regard to the function and dimensions of the absorbing part of the root system as distinct from the merely conducting portions. By combining the analyses made in these studies with data concerning the commercial aspect of Egyptian cotton it has been shown that root asphyxiation produced by a rising water table is the principal cause of the deterioration in yield per acre which the crop has suffered.

In discussing the physiological outlook essential for an effective analysis of agricultural yield, the author asserts that the method of study employed in these investigations is a matter of adjustment depending only on the choice of cardinal points for observation in the crop to be studied, and that a superposition of the continuous observation method upon the scattered small-plat methd may be expected to link plant physiology more closely to agriculture. With a proper conception of the law of limiting factors, as advanced by F. F. Blackman, and of the frequent predetermination of their effects, there is thought to be abundant opportunity for advances in the knowledge of so-called "crop physiology" by applying these methods of continuous registration to plant development. The limitations of the plant-development curves as tools for purposes of research are (1) that the data required for their construction must almost invariably be obtained daily throughout the season, since the day is the real time limit in which a plant measures its experiences, and (2) that they necessitate considerable labor. Opposed to these disadvantages is the fact that they abolish the probable error of plant experiments, thereby achieving good results with controlled areas otherwise far too small if the yields were not thus analyzed. The author continues:

"It is probable that the solution lies in compromise, by first establishing a set of standard data, as complete as possible, for any given crop and district, with which any subsequent observations of salient features could be compared. The establishment of such a set for the Gheezeh Cotton Experiment Station was one of the author's chief aims. . . . The desired extension of the observations to minor outlying stations in other parts of Egypt would have provided not only a system of precise crop reporting, on the lines of a weather report, but also a system of crop forecasts.

"Our principal general conclusion is, therefore, that Blackman's law of the limiting factor provides the key by which the intricate relations of any crop to its environment may be satisfactorily unlocked, provided only that these

reactions are expressed numerically, with definable significance; that they are duly referred in their origin to that stage of the plant's development at which they were actually induced; [and] that the crop is treated as an average plant whose physiology is the subject of investigation."

Arborescent cotton plants, "de Motril" and "Caravonica," C. Rivière (*Bul. Soc. Nat. Acclim. France, 63 (1916), No. 2, pp. 46–55; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 5, pp. 683, 684*).—On the basis of the history of the two arborescent cotton plants named the author maintains that cotton is capable of infinite variation and is much affected by environment and cultural methods. From this it follows that the habit of growth, shape of leaves, and size of inflorescence, as well as the length and character of the staple, are not fixed characters upon which economic cultivation can be established, but that preliminary tests must be made to determine the qualities of the plant.

He regards de Motril as closely related to *Gossypium hadyanum*, described by Todaro as coming from the Algiers Experimental Gardens and which, according to the author, is a long-stapled Georgia much resembling Sea Island from which Caravonica was derived. The latter had a strong tendency to degenerate into common varieties.

As experimental proof of his hypothesis, the author recalls that some neglected plants of *G. herbaceum* found by him on the dunes of Biserta produced in the Algiers Experimental Gardens individuals with luxuriant growth which did not at all appear to have had a common origin. On the other hand, plants raised from the seed of equally fine individuals, when grown under unfavorable soil and cultural conditions, produced offspring to which different origins both as regards country and race would certainly have been attributed.

Some notes on malangas, R. S. Cunliffe (*Agriculture [Cuba], 1 (1917), No. 3, pp. 21–29, figs. 5*).—The production of Blanca and Amarilla malangas in Cuba is described. The composition of these two varieties compared with that of potatoes, sweet potatoes, and cassava, as determined by analyses made at the Maine Experiment Station, show that they compare favorably with the other crops. The albuminoid ratio was found to be 1:16 for Blanca and 1:10 for Amarilla malangas.

Cultural tests with large and small seed tubers of Amarilla malangas gave an increased yield of 1,920 kg. (approximately 4,224 lbs.) per acre for the large seed. Tubers cut to sets of several eyes gave an increased yield of 1,600 kg. per acre over large, whole tubers and of 3,824 kg. over small, whole tubers.

Spring oat production, C. W. Warburton (*U. S. Dept. Agr., Farmers' Bul. 892 (1917), pp. 22, figs. 9*).—This is a revised edition of Farmers' Bulletin 424 (E. S. R., 24, p. 237).

A study in the assimilation of nutrients by the rice plant, Jatindra Nath Sen (*Agr. Research Inst. Pusa Bul. 65 (1916), pp. 13, pl. 1; abs. in Nature [London], 99 (1917), No. 2476, p. 131; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 3, pp. 359, 360*).—Studies of the assimilation of nitrogen, phosphoric acid, and potash in the rice plant in India are reported. The life of the plant was divided into six stages; namely, seedling, transplanting, pre-flowering, flowering, milk, and dead ripe, and the percentage of total nitrogen, phosphoric acid, and potash contained in the root, stem, leaf, ear, grain, and chaff determined and reported in tabular form, together with the content of total nitrogen, phosphoric acid, and potash per plant. The feeding value of the different parts of the rice plant at the various stages of growth was also determined. From the data secured the following general conclusions were drawn:

The total dry matter in rice plants increased up to maturity, the greatest increase occurring, however, before the formation of the flowers. The percentage of nitrogen showed a steady and continuous decrease from the first to the last period of growth, the most rapid decline being noted in the second period. There was a very slight increase in total nitrogen in the roots during the last stages. The phosphoric acid content of the above-ground portions varied but slightly during the seedling and flowering stages, while in the roots there was a slight but regular decline through all stages. The percentage of potash in the above-ground parts increased from the seedling to the preflowering stage, after which there was a decline. In the roots the decline set in after the transplanting stage. As the ears formed, a concentration of nitrogen, phosphoric acid, and potash occurred in the grain at the expense of the other parts of the plant. The assimilation of the three principal plant food elements was practically completed by the flowering stage, hence the earlier stages were more or less critical. No downward transmigration of the absorbed nitrogen and potash into the soil was observed. With a yield of 900 lbs. of dry grain the soil suffered a loss of 29.33 lbs. of nitrogen, 9.64 lbs. of phosphoric acid, and 49.69 lbs. of potash per acre when the grain and straw were removed.

Rye growing in the Southeastern States, C. E. Leighty (*U. S. Dept. Agr., Farmers' Bul. 894* (*1917*), *pp. 14*).—The advantages of increased rye production and the conditions under which rye is deemed preferable to wheat in the southeastern United States are outlined. Field practices and cultural methods employed in growing the crop are discussed and the principal weeds and insect and disease enemies of the crop noted.

Sorghums for forage in South Dakota, M. Champlin and G. Winright (*South Dakota Sta. Bul. 174* (*1917*), *pp. 624–645, figs. 15*).—This bulletin reports the results of comparative trials of different sorghums and outlines directions for growing the crop based on field experiments conducted partly in cooperation with the U. S. Department of Agriculture on the station farms at Brookings, Cottonwood, Eureka, Highmore, and Vivian. The experimental work covered the period from 1912–1916, inclusive.

The sorghums are regarded as valuable catch crops and especially profitable under weather conditions unfavorable to corn, but were not otherwise deemed superior to the latter. Sudan grass proved best for hay purposes, varieties of amber cane such as Minnesota Amber and Dakota Amber for high tonnage of coarse forage, and Dwarf Milo for silage. Sudan grass gave the highest average yields when grown in drill rows 6 and 12 in. apart, amounting to 2.84 and 2.63 tons per acre, respectively, although satisfactory yields were secured when the crop was grown in cultivated rows. Amber cane and Dwarf Milo gave the best results when grown as cultivated crops. Seeding from May 20 to June 1 or later is recommended and the importance of shallow seeding emphasized.

Sugar beets in South Dakota, J. H. Shepard and R. C. Sherwood (*South Dakota Sta. Bul. 173* (*1917*), *pp. 592–620, figs. 12*).—This reports the continuation of work with sugar beets, previously noted (E. S. R., 29, p. 635), giving a brief discussion for each season from 1913 to 1916, inclusive, together with tabulated data showing the results of variety tests for each year.

Better results were obtained by analyzing the mother beets in the spring and planting immediately rather than by removing the roots from storage for analysis during the winter. The loss in sugar content during storage is estimated to be about 2 per cent. The mother beets selected from the different varieties have shown a variation in sugar content ranging from 18 to 22 per cent.

The highest average tonnage for six years has amounted to approximately 18 tons per acre for 18-in. rows.

Although it has been demonstrated that commercial beet seed production is possible and profitable in the State, it is not deemed feasible for the individual farmer but should more properly be financed and operated by sugar beet seed companies.

Velvet beans, J. R. Fain, S. H. Starr, and P. O. Vanatter (*Ga. State Col. Agr. Circ. 48* (*1917*), *pp. 4*).—The production and use of velvet beans in Georgia are briefly outlined. In a tabular comparison of the yields of 14 varieties Medium Early showed the highest yield for 1916, 24.62 bu., with a yield of S.15 bu when sown with corn. Ninety-Day Bunch gave the highest yield when sown with corn, 11.55 bu. The latter variety required 135 days to mature, the former 170.

Velvet beans in Mississippi, E. B. Ferris (*Mississippi Sta. Bul. 179* (*1917*), *pp. 19, figs. 4*).—Approved field practices and cultural methods for velvet bean production in Mississippi are outlined and the value of the crop as a feed and for soil improvement noted. It is concluded from "15 years' experience on the cut-over lands of south Mississippi . . that cattle and hogs with corn and velvet beans will come nearer solving the problem of profitable agriculture for the section as a whole than all other things combined."

Growing winter wheat on the Great Plains, E. C. Chilcott and J. S. Cole (*U. S. Dept. Agr., Farmers' Bul. 895* (*1917*), *pp. 12*).—The adaptation, relative value, and cultural methods of winter wheat production are briefly reviewed for Montana, North and South Dakota, Nebraska, Wyoming, Colorado, Kansas, Oklahoma, Texas, and New Mexico.

Limited rainfall is regarded as the controlling factor in crop production in the Great Plains, the relation between soil moisture at seeding time and yield being much closer with winter wheat than with other crops. Well-prepared land, summer tillage, and a sufficient moisture supply to a depth of 3 ft. are deemed essential to a successful crop.

In the northern section of the Great Plains winter wheat can be replaced with spring wheat without serious loss. In the central section winter wheat is deemed superior to spring wheat, and can not be replaced by the latter without serious loss. In the southern section winter wheat is regarded as less certain and less productive than farther north, and can not be replaced by spring wheat.

Proportion of grain to sheaf as a factor in wheat selection, J. T. Pridham (*Agr. Gaz. N. S. Wales, 28* (*1917*), *No. 2, pp. 91–94*).—The proportion of grain to sheaf was determined for 36 varieties of wheat at Cowra in 1914, and for 55 varieties in 1915, in an attempt to ascertain whether a high proportion of grain to sheaf is generally associated with high grain yield per acre. The results obtained indicated that a rather higher proportion of grain to sheaf was present in the heavier-yielding varieties, but that the proportion varied with the season.

Plants of two strains, "A" and "B," of a hybrid Yandilla King × Zaff in the sixth generation were harvested in 1914 to secure a wheat with a high proportion of grain to sheaf. Strain A appeared to be constant, while Strain B appeared to be mixed. In 1915 seed was sown from one plant "Q," representing the A strain, and from two plants "D" and "E," representing the B strain. Q reproduced the uniform results of the parent, but D and E appeared to include two strains, each one yielding a higher proportion of grain to sheaf than the other. The few higest-yielding plants, however, had a medium to low proportion of grain to straw, and it is concluded, therefore, to be unwise to pursue selections for this quality except as of secondary importance to that

of yielding ability. High grain yields were not associated with a very high proportion of straw, but neither were they correlated with a very low proportion. The results seem to indicate that as between plants of the same variety gross yield is sufficient to determine the most productive plants for grain.

Seed Reporter (*U. S. Dept. Agr., Seed Rptr., 1 (1917), No. 1, pp. 4*).—This marks the initial issue of a monthly publication dealing with material that may arise from time to time relative to the production, handling, and marketing of seeds, including the following subjects: Seed crop movement; receipts, shipments, and imports of seeds; available supplies, demand, prices, and quality of seeds; commercial varieties of seeds; special crop reports; seed marketing and seed crop studies; crop estimates; reports of the seed stocks committee; and miscellaneous news items deemed of interest and value to seed growers and dealers.

The current number includes a brief outline of the purposes and activities of the committee on seed stocks, special articles on the storage of seed wheat in the Northwest, the seed-corn situation in the Northwest, and the soy-bean situation in eastern North Carolina. Statistics are presented on marketing and production surveys of timothy in Iowa, Minnesota, Missouri, and Illinois; on alfalfa in Kansas; Kentcky bluegrass in Kentucky; redtop; orchard grass in Kentucky and Indiana; clover seed in Wisconsin and Minnesota; movements of meadw fescue; and on imports of forage-plant seeds permitted entry into the United States.

A seed key to some common weeds and plants, E. L. Palmer (*Proc. Iowa Acad. Sci., 23 (1916), pp. 335–394, figs. 41*).—Seeds of 118 common weeds and plants, many of which occur as adulterants in the seed of red, white, and alsike clovers, alfalfa, timothy, and redtop, are described, and a key provided for their identification. The object of the work is to furnish a method for accurately determining the names of various seeds and seedlike fruits, with the express purpose of detecting adulterants in commercial seeds, to aid in determining plants in the fruiting condition when the flower parts are too far advanced for the usual identification methods and to serve as a check in determinations from a study of the flowers. A brief bibliography of literature relating to seed study is included.

HORTICULTURE.

Vegetable forcing, R. L. Watts (*New York: Orange Judd Co., 1917, pp. XX+431, figs. 156*).—A practical treatise on vegetable forcing. The first part of the book discusses greenhouse construction and heating; soils; manures, lime, and fertilizers; soil preparation; soil sterilization; insect enemies and their control; diseases and their control; starting plants; watering, heating, ventilating, and shading; and marketing. Separate chapters then deal with the history, importance, and methods of forcing asparagus, rhubarb, lettuce, cauliflower, radish, tomato, cucumber, muskmelon, and miscellaneous vegetables. Systems of cropping, the management of frame crops, and mushrooms are also discussed.

The work as a whole is based upon commercial practice and the recent literature of the subject.

The California vegetables in garden and field, E. J. Wickson (*San Francisco: Pacific Rural Press, 1917, 4. ed., rev. and enl., pp. 319, pls. 23, figs. 6*).—The present edition of this work (E. S. R., 29, p. 435) is revised and extended to include recent practice in vegetable growing.

Vegetable growing, G. Truffaut (*Produisez des Légumes. Versailles, France: Author, 1917, pp. 128, pl. 1, figs. 47*).—A cultural treatise including a monthly working calendar, prepared with special reference to French conditions.

Everyman's garden in war time, C. A. Selden (*New York: Dodd, Mead & Co., 1917, pp. XIV+338*).—A popular treatise on home gardening and fruit growing, including a weekly working calendar.

Report of the State horticulturist, C. L. Wilkins (*Agr. of Maine, 1916, pp. 38–76*).—A brief report on the inspection of nurseries and orchards and premises, as well as foreign-grown nursery stock imported into the State of Maine during 1916. Short papers on markets by H. A. Emerson and on birds of the orchard by W. E. Powers are also included.

[Report of horticultural investigations], O. B. Whipple (*Montana Sta. Rpt. 1916, pp. 175, 176*).—Mulching experiments with vegetables were continued during the year (E. S. R., 36, p. 236). Cabbage, cauliflower, endive, and turnips were slightly improved by mulching. Warm season crops were noticeably retarded by the mulch, probably due to the reduction in soil temperature.

The season's studies of premature seeding of celery again showed that moving the plants to a cold frame early was one of the most important factors favoring premature seeding. Of 36 varieties of early sweet corn tested the most promising ones were Early June, Indian, Burbank 86, Early Mayflower, and Early Malcom. Of six varieties of the common dry beans, Red Indian and Yellow Indian matured best. In storage experiments with cabbage, Danish Ballhead, Mammoth Rock Red, and Danish Roundhead stored best. Of 14 varieties of strawberries tested at the home station, Early Ozark, Senator Dunlap, Marshall, and Kellogg Prize passed the winter of 1915–16 very well without protection.

The results of investigations being carried on at the horticultural substation have been reported in a recent bulletin (E. S. R., 37, p. 241).

Market gardening (*Sta. Agron. Finistère et Lab. Dept. Bul., 1916, pp. 102–124*).—Fertilizer experiments with all of the important vegetables grown in the Department of Finistère, France, are here reported.

Head lettuce for Ohio greenhouses, S. N. Green (*Mo. Bul. Ohio Sta., 2 (1917), No. 11, pp. 370–374, figs. 2*).—The results are given of a comparative test of leaf and head lettuce conducted in the station greenhouses during the past five or six seasons.

Leaf lettuce of the Grand Rapids type was found to grow faster and make heavier heads than the head lettuce during the fall months. During the winter months head lettuce matured somewhat quicker and produced about the same weight heads as leaf lettuce. Experience during the past six seasons has shown that varieties of head lettuce may be bred to a degree of disease resistance. Soil sterilization for the control of diseases has proved of considerable value in raising lettuce, but renewal of the soil every year has given the best results.

In view of the possible overproduction of the loose-leaf Grand Rapids lettuce in Ohio, greenhouse men are advised to experiment with head lettuce and develop strains resistant to disease and tipburn. Head lettuce marketed by the station during the winter months was sold without difficulty at a good price.

Growing Bermuda onion seed in the southwestern United States, S. C. Mason (*U. S. Dept. Agr., Bur. Plant Indus. [Pub.], 1917, pp. 6, figs. 3*).—The author briefly reviews the present status of the Bermuda onion industry in the Southwest and gives an account of experiments in the production of Bermuda onion seed at the Cooperative Testing Station, Sacatan, Ariz. Suggestions are also given relative to the selection of seed stock bulbs, planting, culture, and harvesting the seed. The author concludes that there seems to be no reason why all the American demand should not be supplied with home-grown seed, but that such production should not be undertaken outside of limited areas in southern Arizona and California having the requisite mild winter temperature and dry air of the summer season.

Storing vegetables for winter, M. C. MERRILL (*Utah Sta. Circ. 26 (1917), pp. 8*).—This circular discusses the fundamental principles of vegetable storage, storage requirements, types of storage, and storage conditions for different types of vegetables.

The propagation of fruit trees, A. and GABRIELLE L. C. HOWARD (*Sci. Rpts. Agr. Research Inst. Pusa, 1916–17, pp. 48–50*).—Experiments conducted at the Fruit Experiment Station at Quetta, Baluchistan, have demonstrated that the fruit stocks generally used in growing peaches, nectarines, plums, apricots, etc., on the damp soils of Great Britain and the north of France are quite unsuitable for the hot, dry soils of Baluchistan. On the other hand, such stocks as Mariana, myrobalan, mahaleb, and Jaune de Metz Paradise have done exceedingly well.

Cross-pollination experiments in 1916 and 1917, M. VAN OIJEN (*Maandbl. Nederland. Pomol. Ver., 7 (1917), No. 11, pp. 164–176, pl. 1, figs. 2*).—The results are given of cross-pollination experiments conducted with cherries at Maastricht, Holland, in 1916, and of similar experiments with pears and apples conducted in a private fruit garden in 1917.

Some observations on the growth of apple trees, J. H. GOURLEY (*New Hampshire Sta. Tech. Bul. 12 (1917), pp. 3–38, figs. 9*).—In connection with the long-continued orchard management study being conducted at the station (E. S. R., 37, p. 833) annual growth measurements of mature apple trees growing under different systems of cultivation were made for a period of nine years, and daily growth measurements were made for the seasons 1913, 1914, and 1916. The present paper presents data and observations on these measurements, together with data recorded in 1916 showing the effect of various systems of cultivation on soil temperature.

Soil temperature records were taken almost daily from April 13 to September 20 in the following five plats: Permanently in sod, clean cultivation each year, cultivation with a cover crop, cultivation with a cover crop and a complete fertilizer applied each spring, and a plat similar to the last, with the complete fertilizer high in nitrogen. During the early spring the sod plat was the coolest and those having a heavy mat of cover crops were next lowest in temperature. The clean tilled plat and the tillage cover crop plat to which no fertilizers had been added showed the highest soil temperature. No soil temperatures were taken during the winter months, but observations were made on the depth to which different plats were frozen on March 6. The results in general indicate that soil temperature is warmest under the sod plat, followed by the plats with fertilized cover crops, and the coolest under the clean culture and light cover crop plats during the winter months. During the summer months the soil temperature runs lowest under the heaviest vegetation and highest under clean culture.

"In the ninth year of this experiment the trees under a system of cultivation with cover crops exceeded in annual twig growth the trees in sod by 80 per cent. All the plats receiving a complete fertilizer in addition to cultivation and cover crops showed a marked increase in twig growth after the sixth year of the experiment and in the ninth year these plats averaged 26 per cent greater twig growth than the plat without fertilization. A difference in color of the foliage, however, was not noticeable until the ninth year and no increase in yield has yet occurred. The clean culture plat did not average as great an annual twig growth in the second 4-year period of the experiment as in the first 4-year period, but in the ninth year was 58 per cent greater than the sod plat. The yields, as yet, have not been so affected in the clean culture plat.

"The daily growth was more or less erratic each season, i. e., not following consistently any external factor under observation. The growth curve follows the air temperature more closely, however, than any other external factor recorded. There is no close correlation between the humidity curve and growth curve. It is not possible to control the separate factors under field conditions. These conclusions are based on 43,000 measurements during three seasons.

"The growth is much more readily affected by external factors in the early period of its growth than when it is approaching the resting period. The grand period of growth in this orchard was a period of about 25 days (3 years considered)." The "grand period" as here used refers to the period in which practically all the growth is made, beginning somewhere between May 20 and 25 and practically ceasing the latter part of June.

[Orchard cover crops]. H. A. MORGAN (*Tennessee Sta. Rpt. 1915, p. 116*).—Experiments conducted at the west Tennessee station with Japan clover as an orchard legume for summer and winter cover indicate that Japan clover taxes too heavily the water supply of a young orchard to permit growing it close to the tree. It is killed by the first freezes in the fall, the heavy growth dries rapidly, and there is grave danger from fire during the winter months. This winter mulch offers acceptable quarters for field mice and rabbits. On the other hand, it is an excellent plant to prevent erosion of orchard soils. It reseeds itself and until the excessive growth is sufficient to smother the very young plants one seeding may be sufficient for years. The rapid accumulation of nitrogen and its effect upon the trees after the second year soon outweighs the tax of the clover upon the water supply when the trees were younger. The extremely matted growth prevents the growth of crab grass and summer weeds.

From the results of this experiment it is concluded that "Japan clover should be grown for two years prior to the setting of an apple orchard upon the orange sand lands of west Tennessee. The crop of the second year should be turned under in September and well worked into the soil prior to the setting out of the orchard in December or later. For two years succeeding, crimson clover sown in August should be grown as winter and spring cover, and the ground cultivated from May until August. For two years succeeding, and longer, Japan clover may be grown, until the shade of the large trees prevents profitable growth."

Everbearing strawberries, G. M. DARROW (*U. S. Dept. Agr., Farmers' Bul. 901 (1917), pp. 19, figs. 7*).—This publication deals with the special cultural practices that have been developed in the production of varieties of strawberries that fruit during the summer and autumn. Introductory considerations deal with the desirability of everbearing sorts of strawberries, origin, and characteristics and adaptation. Information is then given relative to soils, fertilizers, time of planting, planting systems, distance of planting, removing blossoms and runners, tillage, mulching, duration of a plantation, harvesting, yields, and varieties.

Currant growing an important, promising industry for California, G. C. HUSMANN (*Cal. Fruit News, 57 (1918), No. 1542, p. 1*).—As a result of viticultural investigations conducted by the U. S. Department of Agriculture for a number of years the chief difficulties that have previously prevented the successful culture of the dark-colored commercial currants in California have been overcome.

It is necessary that the vines be grafted on resistant stocks congenial to them and suited to the soil and other conditions in which grown. Congenial and resistant stocks have been found for important soil types in the grape districts. It is also necessary to incise or decorticate the vines when they are in bloom to produce a full setting and maturing of the fruit, and to produce fruit of the

best quality. In making the incision, a ring of bark is removed from either the trunks, arms, or canes of the vines.

The department is studying further cultural details. Only one variety of currant, the Panariti, is recommended for planting. Other dark-colored varieties hitherto tried in California have proved worthless.

Raspberry culture, G. M. Darrow (*U. S. Dept. Agr., Farmers' Bul. 887 (1917), pp. 44, figs. 33*).—A treatise on raspberry culture based on practices which have proved highly successful in different sections. The author discusses the types of raspberries, extent and distribution of raspberry growing, location of a plantation, site of a plantation, preparing the land, planting, moisture supply in the soil, intercropping, tillage, maintenance of fertility, systems of training and pruning, winter protection, duration of a plantation, harvesting, yields, diseases and insects, propagation, varieties, and uses.

Indian tea: Its culture and manufacture, C. Bald (*Calcutta: Thacker, Spink & Co., 1917, 3. ed., pp. 373, pls. 27, figs. 9*).—The present edition of this work (E. S. R., 21, p. 335) has been revised, partially rewritten, and somewhat enlarged.

Notes on the production and commerce of cacao, M. Calmon du Pin e Almedia (*Notas Acerca da Producção e Commercio do Cacau. Rio de Janeiro: Soc. Nac. Agr., 1917, pp. 21; Jor. Com. [Rio de Janeiro], 91 (1917), No. 160, pp. 3, 4*).—A statistical account of the world's cacao industry, including data on production, consumption, import taxes, etc., in different countries.

The data palm in Egypt, T. W. Brown (*Agr. Jour. Egypt, 5 (1915), No. 1–2, pp. 63–79, pl. 1; 6 (1916), pp. 18–38, pls. 6*).—Part 1 of this article discusses the methods of propagating the date palm, planting, and subsequent care, including methods of pollinating the female trees; part 2 treats in detail of the various kinds of dates grown and their relative commercial importance.

South American markets for dried fruits, W. Fischer (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Spec. Agents Ser., No. 148 (1917), pp. 35*).—This is a short survey of the dried-fruit trade in South America, based on data gathered and observations made during the season 1915–16 in connection with an investigation of the fresh-fruit markets of that continent (E. S. R., 37, p. 345). The present report discusses the purchasing power and the customs, tastes, and needs of the people, the current high prices, and the sources from which dried fruits are obtained, as factors determining the total consumption and the small share supplied by the United States. There are supplementary sections on California fruits in South America and on methods of distribution.

FORESTRY.

Incidental results of a study of Douglas fir seed in the Pacific Northwest, C. P. Willis (*Jour. Forestry, 15 (1917), No. 8, pp. 991–1002*).—In connection with the collection and drying of cones for a study of Douglas fir seed during the fall of 1912 a number of incidental experiments were conducted and are here discussed.

With reference to the proper time to collect cones, it was found that a considerable amount of good seed may be procured from cones entirely green in color, although the largest quantity of good seed is not obtained by this procedure. It seems satisfactory to collect cones when they first begin to assume a brownish hue. Actual tests indicate that in picking cones it is wise to take from a given tree only the larger, better developed cones. Large cones produce large seed and small cones small seed. The large seed was found to have a much higher germination percentage.

Studies were made relative to the best temperature for cone drying in a kiln. The results in general indicate that drying is the complex result of temperature, humidity, and air circulation. A relatively low temperature (even 130° F.) may be fatal to seed if the cones are green or the atmospheric humidity high. A similar temperature may be dangerous if any of the seed happens to be much exposed during treatment, and specially so if the humidity is low. With green cones, which are not well adapted to kiln treatment, a uniform temperature of over 100° is apt to cause great loss, largely through the superheating of the seed. Cones moderately dry can be exposed to temperature as high as 140°. It is suggested, however, that in view of the danger of excessive drying the temperature should be as low as is compatible with economy.

Seed that does not shake out readily from partially opened cones was found to be usually of high quality and worth saving, unless extra shaking is for some reason too expensive. The seeds last shaken out are apparently no smaller than those which are first extracted. The germination percentage is sometimes slightly low with the seed last obtained.

Methods of hastening germination, S. B. Show (*Jour. Forestry, 15 (1917), No. 8, pp. 1003–1006*).—In the spring of 1913 tests were made by the Feather River Experiment Station, near Quincy, Cal., of a number of different methods of hastening the germination of tree seed. The results of tests conducted with seed of sugar pine, western yellow pine, Jeffrey pine, and incense cedar are here presented in tabular form. The data as a whole were not conclusive, but indicate, however, that soaking in solutions of sulphuric acid gives the best results for sugar pine seed.

Osmotic pressure as an index of habitat, B. Moore (*Jour. Forestry, 15 (1917), No. 8, pp. 1010–1013*).—The author reviews recent investigations relative to the freezing-point depression and osmotic pressure of plant tissues in relation to environment, and calls attention to their direct bearing on forest research in that they reveal the existence of an index of habitat which may be of great value in silvical studies.

The farmer's woodlot, J. J. Crumley (*Mo. Bul. Ohio Sta., 2 (1917), No. 11, pp. 375–380, figs. 2*).—This paper discusses the present condition of small woodlots in the more level sections of Ohio, with special reference to the detrimental effects of pasturing woodlots.

Advice to forest planters in the plains region, S. D. Smith (*U. S. Dept. Agr., Farmers' Bul. 888 (1917), pp. 23*).—This publication gives advice about tree planting in the plains region to provide windbreaks, supplies of firewood, fence posts, and wood for repairs. A descriptive list is given of trees adapted to the northern and southern plains region, together with a discussion of mixed plantations, ornamental plantings, the details, methods, and time of planting, spacing, cultivation, thining, pruning, protection, and where to secure trees and seeds. The publication concludes with a general list of "don'ts" for tree planters.

Planting experiments on the sand dunes of the Oregon coast, T. T. Munger (*Jour. Forestry, 15 (1917), No. 8, pp. 1007–1009*).—A brief statement of tree planting work conducted during the period 1910 to 1916. The experiments have been discontinued for the present because it appears that afforestation, except of the very best of the sand waste country, will not be possible until a herbaceous cover has first been established to stop the sand movement.

Axton plantations, B. E. Fernow (*Jour. Forestry, 15 (1917), No. 8, pp. 988–990*).—With a view to furnishing a record for future reference, the author here presents a memorandum of the silvicultural work done by the former New York

State College of Forestry at Axton, N. Y. The present condition of the different forest plantations is also briefly noted.

Report of the director of forestry for the year 1916, R. H. Campbell et al. (*Dept. Int. Canada, Rpt. Dir. Forestry* (*1916*), *pp. 95, figs. 26*).—The report includes a review of the several lines of work conducted by the forestry branch during the year and detailed reports of the work of the tree-planting division and on the forest reserves in the separate Provinces, together with the report of the Forest Products Laboratory of Canada.

[Report on] forestry (*Ann. Rpt. Reforms and Prog. Chosen* (*Korea*) (*1915–16*), *pp. 129–134, pl. 1*).—A progress report on forest activities in Chosen during the year ended March 31, 1916, discussing forest protection, forest surveys, experimental afforestation, nursery work, and Arbor Day planting. Since April 3, 1911, the first Arbor Day, some 56,200,000 trees have been planted, especially by school children.

State ownership of forest lands, P. T. Coolidge (*Jour. Forestry, 15* (*1917*), *No. 8, pp. 951–973*).—A discussion of State ownership of forest lands as a governmental policy.

Instructions for making timber surveys in the National Forests, including standard classification of forest types (*U. S. Dept. Agr., Forest Serv.* (*1917*), *pp. 53*).—The purpose of this handbook is to present the policy of the Forest Service for the conduct of timber surveys and to standardize the methods used in the districts to the extent necessary to insure reasonably accurate and uniform results.

Alnus oregona: Its value as a forest type on the Siuslaw National Forest, H. M. Johnson (*Jour. Forestry, 15* (*1917*), *No. 8, pp. 981–987*).—A discussion of the red alder (*A. oregona*) with reference to its silvical characteristics and value as a nurse crop for Douglas fir, as a soil builder, for fire protection to second growth and reproduction, and its commercial value.

Rubber cultivation in Trinidad and Tobago, N. Lamont et al. (*Bul. Dept. Agr. Trinidad and Tobago, 16* (*1917*), *No. 3, pp. 95–127*).—A report of a special committee of the Trinidad Board of Agriculture relative to the present status and future prospects of rubber cultivation in Trinidad and Tobago, including suggestions relative to cultural practices and the development of efficient tapping methods and uniform plantation methods of preparing rubber.

Rubber culture in the Philippines, P. J. Wester (*Philippine Agr. Rev.* [*English Ed.*], *10* (*1917*), *No. 3, pp. 201–220, pls. 4, figs. 2*).—The author reviews the present status of the plantation rubber industry, discusses the Philippines as a possible future source of rubber, and gives directions for the culture, harvesting, and preparation of Para rubber.

DISEASES OF PLANTS.

Problems of plant pathology, F. L. Stevens (*Bot. Gaz., 63* (*1917*), *No. 4, pp. 297–306*).—This paper, dealing mainly with plant pathology as primarily an economic subject and referring also to the relations between science and pathological practice, offers suggestions regarding the classification of fungus plant diseases.

The dissemination of parasitic fungi and international legislation, E. J. Butler (*Mem. Dept. Agr. India, Bot. Ser., 9* (*1917*), *No. 1, pp. 73*).—This paper has for its primary object a discussion of the means by which parasites are able to cross oceans or tracts having only plants unsuitable to their spread. The principal means include birds, air movements, and commercial transportation of products. Control of the dissemination of diseases is discussed according to the cases in which the disease has already succeeded in gaining a foothold in

the country, those in which it has reached neighboring countries only, and those in which it is still confined to areas isolated by the ocean or large tracts with climate and vegetation unfavorable to the spread of the disease organism.

As illustrative of the probable means of introduction of foreign species, the rusts of Australia are taken, some 27 of which are treated as introduced species and are discussed in connection with their hosts and several modes of introduction. The work of the International Phytopathological Convention held in Rome in 1914 is discussed in this connection.

Report of the botanist, S. M. Bain (*Tennessee Sta. Rpt. 1915, pp. 118–120*).—A summary report is given of investigations carried on by the department of botany on the selection of pear and apple seed for blight resistance, the physiology of the resistance of clover to Colletotrichum, and the resistance of Spirogyra to various fungi. The work with the pear and apple has only been begun, extensive plantings of seed from different sources having been made.

In the studies of clover resistance the maximum temperature endured by Colletotrichum spores was found to be about 45° C. (113° F.), the spores being killed by a moment's exposure to that temperature. This is believed to explain why so many samples of spores taken in the field during the season failed to germinate. Preliminary experiments indicate that infection of clover occurs much more readily in tissues in an actively growing or meristematic condition.

Experiments with Spirogyra are reported upon, Spirogyra having been selected as a convenient host plant for microscopical study. Three or four different fungus diseases of Spirogyra have been found and studied to some extent, the fungi being obligate parasites, facultative parasites, and saprophytes. The results of a microscopical study of the methods of attack showed that Pythium infects by zoospores, large numbers of which collect on Spirogyra cells that have just died. They do not collect upon living cells or upon cells long dead. Infection always starts at a dead cell. The advancement of the mycelium through the Spirogyra filament is said to take place with great rapidity, as many as seven cells having been killed in an hour by a single filament of Saprolegnia.

[Plant diseases in Barbados], J. S. Dash (*Rpt. Dept. Agr. Barbados, 1915–16, pp. 35–40*).—The most notable sugar cane trouble observed during this period was that known as the pineapple disease (*Thielaviopsis paradoxa* (*T. ethaceticus*)). No connection was established between this fungus and *Melanconium sacchari*, the cause of rind disease. *Colletotrichum falcatum* was not present to any considerable extent.

Examination of a new disease of sugar cane showed that the last-named fungus was often present with a Cephalosporium, which was studied and is herein discussed at some length. The disease does not seem to attack canes growing under very favorable conditions. Its progress is slow. Destruction of rotten canes and selection of plant material are expected to control the disease.

Cotton suffered severely only from leaf spots and mildew during this period. A branch disease of pigeon pea is ascribed to a Colletotrichum. Examination of dying sorrel plants showed a species of Glœosporium, and a second species was found to cause a dieback and leaf cast in a single breadfruit tree.

Plant protection in Switzerland, F. G. Strebler, A. Volkart, and A. Grisch (*Schweiz. Samen Untersuch. u. Versuchsanst. Derlikon-Zürich, Jahresber., 39 (1915–16), pp. 23–28*).—This portion of the report deals briefly with diseases of cereal crops, potatoes, beets, legumes, and forage plants, also with nematode attack and weed pests.

[Plant diseases in India], J. Mackenna (*Rpt. Prog. Agr. India, 1915–16, pp. 46–50*).—It is stated that the most important disease under investigation at

Pusa during the year 1915–16 was that of rice known as ufra in eastern Bengal. The cause of this very destructive disease is a nematode (*Tylenchus angustus*) which hibernates in dry stubble, renewing its activity with high atmospheric humidity and heavy rainfall and perishing after immersion for some weeks in water or passing into a dormant state under dry conditions.

Tokras, a parasitic species of Orobanche on tobacco, mustard, and cabbage, were not controlled by the use of sodium nitrate. A study of Rhizoctonia by Shaw (E. S. R., 35, p. 148) has been continued. Studies have been prosecuted on two local plantain diseases and the black thread disease of rubber. Other diseases under investigation are a disease of sal trees; wilts of cotton, sesamum, gram, and chillies; and sclerotial diseases of jute and sugar cane.

A new method of dealing with the palmyra palm disease has proved effective. It consists of very close scrutiny of all palms in a disease center and cutting out and burning all diseased portions of the crown of affected trees. The koleroga disease of the areca palm can be eradicated from isolated areas by means of spraying.

Black rot of coffee is checked by Bordeaux mixture, which also controls brown blight of tea. Of the four smuts of sorghum present in Bombay, two can be prevented by steeping the seed in copper sulphate. Studies have been continued on fungi attacking tea roots and leaves. Poppy blight is epidemic only under adverse climatic conditions and poor drainage. Certain varieties appear to be almost immune to the disease.

Cryptogamic review for 1914 and report on leaf diseases of conifers, G. Briosi (*Bol. Min. Agr. e Indus., Com. ed Lavoro [Rome], Ser. B, 14 (1915), II, No. 1–2, pp. 38–47; Atti Ist. Bot. R. Univ. Pavia, 2. ser., 16 (1916), pp. 285–308*).—This report, which is on the same general plan as that for 1913 (E. S. R., 34, p. 539) gives an account of diseases of conifers, vines, cereals, fruits, forage, garden, ornamental, industrial, and other plants; scientific and miscellaneous studies; and some publications of recent issue.

Cryptogamic review for 1915 with report on grain diseases, G. Briosi (*Bol. Min. Agr. e Indus., Com. ed Lavoro [Rome], Ser. B, 15 (1916), II, No. 5–8, pp. 17–26; abs. in Riv. Patol. Veg., 8 (1916), No. 10, pp. 197, 198*).—This report, which is on the same plan as that noted above, gives more particular attention to grain diseases.

Physoderma disease caused by P. zeæ maydis (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Bul., 1917, Nos. 1, pp. 9, 10; 3, pp. 51, 52, fig. 1*).—A brief account is given of the occurrence and geographic distribution in the United States of *P. zeæ maydis*, which attacks corn. Its known distribution includes the States of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, and Tennessee.

The internal disease of cotton bolls, W. Nowell (*Agr. News [Barbados], 14 (1915), Nos. 344, p. 222; 345, pp. 238, 239*).—The investigation of internal boll diseases of cotton having reached a stage where it is considered as likely that future research must follow entomological as well as mycological lines, the author summarizes the history of this disease and opinions regarding its causation, citing more particularly the findings and views of Robson (E. S. R., 35, p. 44) in this connection.

The general conclusion is that while the staining may be initiated by matter issuing from punctures in the young seeds it is caused by infection with a foreign organism. In most cases this appears to be a specific fungus (not yet named), but infection is in some cases due to other fungi or to bacteria.

The internal disease of cotton bolls, W. Nowell (*Agr. News [Barbados], 15 (1916), No. 364, pp. 126, 127*).—Following up the information given in the

article above noted, the author states that in tests by Robson at Montserrat and Harland at St. Vincent, also by himself with material forwarded from both of these places, the disease was found to be due to the specific fungus mentioned in the article above noted. The facts indicate with apparent certainty the agency (as carriers) of plant-feeding green bugs (*Nezara viridula*). The fungus, which resembles closely *Eremothecium cymbalariæ* and has considerable scientific interest owing to its methods of spore formation, has now been found in material from Tortola, St. Kitts, Montserrat, St. Vincent, and Barbados. It occurs in nearly all the bolls examined, but in a small proportion is replaced by bacteria.

The fungi of internal boll disease, W. Nowell (*West Indian Bul., 16 (1917), No. 2, pp. 152–159, figs. 4*).—The author here presents what is regarded as a preliminary outline of observations made on certain fungi, including one species closely resembling that described by Schneider (E. S. R., 36, p. 749), which occurs in green cotton bolls in the West Indies.

The fungus forms are four in number and are connected by certain features which strongly suggest a close interrelationship. It is thought that the facts here noted may prove to be of considerable importance in future discussions of the taxonomy of the simpler fungi.

It is regarded as proved that the gross staining of lint in unopened bolls (often followed by more or less rotting of the boll contents), which constitutes this disease, is due to infection resulting from the puncturing of the wall of the boll by plant bugs, mainly *Nezara viridula* and *Dysdercus* spp. The infecting organism is, in most cases, one of the four fungi referred to above, though a portion of the infections can be ascribed to bacteria. The proportion of such bacterial infections, though ordinarily small, increases greatly in wet weather.

Infections by the fungi may occur, apparently, at any developmental stage after the establishment of the boll, the effect varying accordingly in ways which are described.

Blight disease of potatoes, B. F. Lutman (*Ann. Rpt. Vt. State Hort. Soc., 13 (1916), pp. 55–60, pl. 1*).—This is a discussion of the development of late blight of potato as it occurs in Vermont, the contributing causes, and the outlook for the near future in that State, with recommendations for its control. These include avoidance of diseased tubers for use as seed and spraying with Bordeaux mixture, beginning about the first week in July and continuing as found necessary.

Sugar cane diseases, R. Averna Saccá (*Bol. Agr. [Sao Paulo], 17. ser., No. 12 (1916), pp. 936–938*).—Further mention is made of some diseases of sugar cane, as noted previously (E. S. R., 37, p. 553), along with a discussion of a mild injury due to *Capnodium* sp. on the stalks in damp situations, and of a severe injury due to a Tylenchus showing analogies to *T. acutocaudatus*, together with remedial measures suggested.

Bitter pit investigation. The cause and control of bitter pit, with the results of experimental investigation, D. McAlpine (*Rpt. Bitter Pit Invest. [Aust.], 5 (1915–16), pp. 144, pls. 38*).—This, the fifth report on bitter pit (E. S. R., 37, p. 455), deals in some detail with yield in relation to bitter pit; crinkle, a confluent form of the trouble; diseases superficially resembling bitter pit; the fruit buds of the apple tree; pruning experiments; the effects of ringing and constricting the branches of apple and pear; experiments conducted under natural conditions with a view to controlling the trouble; the cause of bitter pit; and its control as regards orchard practice, storing, and shipping. It is now considered possible to ship fruit oversea without risk of overripening, and bitter pit may also be considerably reduced.

Many environmental factors contribute to the production of bitter pit. The primary cause, however, is unqualifiedly stated to be the pressure of sap in the outermost layer of pulp cells, which causes them to burst and also ruptures the associated vascular network. This pressure is thus too great for the constitutionally weakened tissue of the cultivated apple. The falling in of the skin is due to a deficiency in its nourishment and to the collapse of the underlying cells. The browning of the tissue originates immediately beneath the skin, but its extension along the conducting vessels may streak the flesh of the apple. There may be also an internal browning not noticeable at the surface. Bitter pit on the tree or in storage develops only in apples approaching maturity, never after its attainment. The pitting is generally confined to the calyx end of the fruit. There are both discrete and confluent forms of pitting.

In the manurial experiments in Victoria, the smallest amount of pitting occurred when bone dust was added to a complete fertilizer, high yield showing but little effect on the disease. In New South Wales the highest yield was associated with the least pitting, which was less than 0.5 per cent, but in South Australia this condition was reversed. In Western Australia the least pitting occurred where 1 lb. of iron sulphate was applied to each tree. Here also fertilizers tended to increase pitting, but the opposite result appeared in New South Wales, South Australia, and Victoria. Excess of nitrogenous manures tends to produce pitting on account of the rapid growth, accumulation of nutritive substances, and imperfect cell development.

Pruning is one of the most important means of control and has received special attention. The best results have been obtained by leader or light pruning. Whatever favors the regulation of the sap and its proportional distribution to the various fruit buds, so that each is well supplied but not gorged, also tends to reduce or prevent bitter pit. In a susceptible variety, such as Cleopatra, pitting has been reduced to from 4 to 6 per cent by pruning. Storage at 30 to 32° F. arrests or retards both bitter pit and overripening, as the apple while at this temperature is in a state described as a sort of suspended animation.

Bitter pit: Its cause and control. Experiments in pruning, manuring, irrigation, cool storing, D. McAlpine (*Fruit World Austral., 18 (1917), No. 4. pp. 92–96, 99, 103, figs. 3*).—This is a brief account of the report above noted.

Effect of temperature, aeration, and humidity on Jonathan spot and scald of apples in storage, C. Brooks and J. S. Cooley (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 7, pp. 287–318, pls. 2, figs. 23*).—A report is given of a study of Jonathan spot and scald of apples in relation to rot infection and the modifying effects of storage conditions and maturity of fruit. Both of the troubles are said to be important, not only because of their damaging effect on the appearance of the fruit, but also because of the part they play in paving the way for the entrance of various rot-producing fungi.

These diseases are said to show many similarities. The initial stages of both are found to be confined to the color-bearing cells of the skin; both render the apple susceptible to rot infections; both are decreased by good aeration and a fair degree of maturity of the fruit; and both are increased by a rise in temperature, having an optimum of about 20° C. and a maximum of about 30°.

The authors consider that apple scald is due to abnormal respiratory conditions resulting from poor aeration. Attention is called to the important rôle which aeration plays in the prevention of apple scald, as may be observed from the small amount of this disease in cellar and air-cooled storage.

Fire blight infection, H. A. Gossard and R. C. Walton (*Mo. Bul. Ohio Sta., 2 (1917), No. 11, pp. 357–364, figs. 5*).—The results are given of an investigation

begun in 1915, in which individual flower clusters, branches, and considerable portions of trees were protected in various ways from insects and from rain.

It was found that a considerable portion of the branches showed infection when protected against the entrance of insects but not protected against rain. Where a tree was protected both from rain drip and from insects, no blight infection occurred. Branches covered with four cheesecloth bags, above which, on the same tree, were artificially inoculated blossoms, showed heavy infection. Other data are presented which indicate that rain acts as a carrier of fire blight bacteria.

Citrus blast, a new bacterial disease, R. W. Hodgson (*Mo. Bul. Com. Hort. Cal., 6 (1917), No. 6, pp. 229–233, figs. 2*).—The author gives a brief account of his own work and that of Lee, as previously noted (E. S. R., 37, pp. 153, 154), on the disease of citrus due to *Bacterium citrarefaciens*. Careful pruning is regarded as the most hopeful means of control at the present time.

[Diseases, injuries, and abnormalities of coconut in the Dutch East Indies], P. E. Keuchenius (*Teysmannia, 27 (1917), No. 11–12, pp. 624–635*).—It is stated that diseases of coconut have not yet assumed very great importance in the Archipelago. Diseases with their causal organisms named in this connection include a leaf spot (*Pestalozzia palmarum*), a fungus bud rot (*Pythium palmivorum*), a bacterial bud rot (*Bacillus coli*), a stem bleeding disease (*Thielaviopsis ethaceticus*) reported previously by Petch (E. S. R., 23, p. 652), and a root rot attributed to a Diplodia. Other phases of abnormality or injury include gummosis, fruit deformity, and the effects of lightning.

Fungus blights of tea in northeast India during the season 1915, A. C. Tunstall (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 2 (1916), pp. 73–76*).—This account names as tea leaf diseases in 1915 blister blight (*Exobasidium vexans*), copper blight (*Læstadia camelliæ*), gray blight (*Pestalozzia* sp.), brown blight (*Colletotrichum camelliæ*), rim blight (*Cladosporium* sp.), and red rust (*Cephaleurus virescens*); as stem diseases, thread blight (sterile mycelium, probably a Corticium) and velvet blight; and as root parasites, *Hymenochæte noxia*, *Ustulina zonata*, *Rosellinia* spp., *Thyridaria tarda*, and *Fomes lucidus*.

Black rot disease of tea, T. Petch (*Dept. Agr. Ceylon Leaflet 2 (1917), pp. 3, fig. 1; Trop. Agr. [Ceylon], 48 (1917), No. 3, pp. 156–158, fig. 1*).—An account is given of a new disease of tea recently appearing in two districts in the low country. It is characterized by the blackening and fall of the younger leaves, which often remain attached to each other or to the stems (which are also attacked) by the mycelium of the fungus, which is said to be an Hypochnus. The spots on the older leaves and the corky warts on the young stems are not so characteristic.

The disease occurs in patches scattered over the field, suggesting spore distribution by the wind. The fungus is thought to come from any of several species of jungle plants, though spores have not as yet been observed, nor has the mycelium (though present on old leaves) been found on the blackened young leaves. The disease is named black rot from its analogies to a disease of coffee of the same name in southern India due to an Hypochnus, but possibly a different species from the one here considered. This fungus is found to remain alive for at least two months on prunings left in the field, or to fill with mycelium closed glass dishes containing infected dead leaves, this mycelium producing readily new infection on fresh leaves subsequently introduced.

Bordeaux mixture is recommended as a means for the control of this disease.

Brown blight of tea, W. McRae and R. D. Anstead (*Planters' Chron., 11 (1916), No. 1, pp. 2–4; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci.*

and Pract. Agr., 7 (*1916*), *No. 5, pp. 757, 758*).—Brown blight (*Colletotrichum camelliæ*) is noted as having caused damage in some localities which are named. The disease is described and directions are given for its control. The author recommends, for the nurseries, removal of affected leaves, spraying with Bordeaux mixture, application of slaked lime to beds, freer admission of light and air to the nurseries, and careful watering when any is necessary; for older plants, modifications of these measures with avoidance of manures tending to produce sappy wood and heavy foliage and the use of those tending to produce harder wood.

[Mycological notes], A. C. TUNSTALL (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 2* (*1916*), *pp. 82–86*).—The author recommends the substitution, for the lever or directly acting spray pumps now in common use, of a wheel and eccentric action to economize labor and equalize wear on the machinery, also of a nozzle capable of producing a very fine but abundant spray close up to the nozzle. The nozzle should be replaceable, owing to the rapid wear to which it is subjected, and to minimize this the use of glass nozzles is suggested. The apparatus should be very simple, durable, and easy of operation to minimize the bad effects of unskilled handling.

Rim blight was noticeable on severely pruned tea plants. It was less noticeable on those which had been sprayed with caustic washes used to relieve a barkbound condition. It is thought best to employ this early in the cold season to avoid giving the tea a setback. Bordeaux mixture applied in March or April is considered more suitable for healthy and vigorous plants.

Basic problems in forest pathology, E. P. MEINECKE (*Jour. Forestry, 15* (*1917*), *No. 2, pp. 215–224*).—The great problems of forest pathology now demanding attention in this country are designated as those of silviculture during the necessary period of transition from virgin forests (still almost universal in the United States) to regulated forests (as now prevalent in Europe). The author emphasizes the need of shaping and carrying out policies for minimizing as much as possible the cumulative losses from various agencies, as previously noted (E. S. R., 35, p. 43).

Polyporus schweinitzii, J. M. MURRAY (*Trans. Roy. Scot. Arbor. Soc., 30* (*1916*), *pt. 1, pp. 56, 57, pl. 1; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr.*, 7 (*1916*), *No. 5, p. 759*).—It is stated that *P. schweinitzii*, long known to attack (but not very severely) a number of conifers in Europe and to be destructive in the northern forests of spruce and fir in the United States, but hitherto considered as rare in the British Isles, is supposed to be increasing there so as to threaten the coniferous forests. Several species have now been attacked by it in this region. The appearance, development, and effects of the fungus are described. Protective measures suggested include cutting off affected roots beyond all signs of rot, tarring the wounds thus made, collection and destruction of young sporophores, and the replacement of badly attacked conifers with hardwood trees.

White pine blister rust disease, A. F. HAWES (*Ann. Rpt. State Forester Vt., 8* (*1916*), *pp. 22–26*).—A very brief account is given regarding the history of the white pint blister rust (*Cronartium ribicola*) in this country, the control measures attempted therewith, and the general results therefrom, also regarding inspection work done in Vermont between May 15 and July 1, 1915, the results of which are presented in tabular form.

Diagnosing white pine blister rust from its mycelium, R. H. COLLEY (*U. S. Dept. Agr., Jour. Agr. Research, 11* (*1917*), *No. 6, pp. 281–286, pl. 1, fig. 1*).—According to the author, by the use of safranin and lichtgruen, it is possible to

stain the mycelium of *Cronartium ribicola* and the cells of the host so that the mycelium may be distinguished from that of other fungi parasitic on white pine bark. The manner in which the parasite attacks the host cells is said to be very characteristic, in that the cells remain alive for a long time when attacked by the blister rust fungus, the hyphæ run between the cells, the bark swells, turns a yellowish-green color, and does not crack until the æcia are produced. The presence in the bark of *Pinus strobus* of mycelium showing these phenomena is considered sufficient evidence to warrant the conclusion that the pine is infected with *C. ribicola*.

The leaf disease of rubber. Conditions in Surinam, C. K. BANCROFT (*Jour. Bd. Agr. Brit. Guiana, 10 (1917), No. 2, pp. 93–103*).—An account is given of the results of inspection of Hevea, coffee, and cacao plantings in Surinam and of examinations at the botanic station at Paramaribo.

The leaf disease first appeared in Dutch and British Guiana about 1907, assumed epidemic form on some plantations in 1914, and at the time of this report existed on every estate in Surinam growing Hevea. It affects trees of all ages and shows no sign of diminution locally, though indications at some of the places are more hopeful. The causal organism, which has been named in different localities *Fusicladium macrosporum*, *Passalora heveæ*, and *Melanopsammopsis heveæ*, is said to be native to Peru, Brazil, Dutch Guiana, British Guiana, and probably Trinidad, occuring in these countries on wild trees of *H. brasiliensis*, *H. guyanensis*, and *H. confusa*. A brief discussion is given of the fungus, its life history, and remedial measures, including destruction of wild Heveas near the plantations and removal of all infected leaves. Defoliation by smoke as a remedial measure is also discussed.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Rodent destruction on ships, R. H. CREEL (*Pub. Health Rpts. [U. S.], 32 (1917), No. 36, pp. 1445–1450*).—A report on the relative efficiency of fumigants as determined by subsequent intensive trapping over a period of one year.

In the fumigation work sulphur dioxid was used on 62 vessels and hydrocyanic acid gas on 182 vessels. The latter resulted in the destruction of 95 of each possible 100 rodents, and the former destroying 77 per cent, notwithstanding the fact that the duration of exposure was 6 hours for holds and superstructures alike when sulphur was used, in contrast to 1½ hours for the holds and 30 minutes for the superstructures with hydrocyanic acid gas. Cyanid was used at the rate of 5 oz. to 1,000 cu. ft., and the sulphur in the proportion of 3 lbs. to 1,000 cu. ft. of space.

"Sulphur fumigation is not effective for the destruction of rats on loaded vessels or in superstructures. . . . Judging from the results of our observations it would appear that the fumigation of engine and fire rooms can, under ordinary conditions, be omitted, without materially reducing the effectiveness of the destruction of rodents on vessels. . . . In exceptional cases, such as demonstrable plague infection on board vessels, it is believed that the engine and fire rooms should be included in the procedure."

See also a previous note (E. S. R., 35, p. 53).

House rats and mice, D. E. LANTZ (*U. S. Dept. Agr., Farmers' Bul. 896 (1917), pp. 23, figs. 10*).—A revised edition of Farmers' Bulletin 369, previously noted (E. S. R., 21, p. 751).

The game birds of West Virginia, E. A. BROOKS (*Bien. Rpt. Forest, Game, and Fish Warden, W. Va., 1915–16, pp. 91–160, pls. 9*).—In addition to descriptions of the species of game birds of West Virginia chapters are devoted to discussions of the forest conditions in the State as related to game birds,

hunting game birds, economic value of game birds, artificial and natural propagation, protection of game birds, and laws for the protection of game birds.

Intra-vitam color reactions, N. A. Cobb (*Science, n. ser., 46 (1917), No. 1181, pp. 167–169, figs. 2*).—The author has met with considerable success in feeding coal-tar and other colored compounds to nematodes. They have not interfered materially with normal metabolism and the best results have been from the cumulative action, using small quantities of color dissolved in the medium in which the nematode lived and allowing the dye to act for days or weeks. "Not infrequently the dyes prove to be highly specific in their action. Only certain cells, or only definite parts of certain cells, exhibit visible reactions in the form of colorations. . . . A dye may give rise to several different colors, none of them like that of the dye itself, and all of them very likely due to new compounds." Present efforts are being directed toward the discovery of dyes of greater or less permanency.

Sodium cyanid as a fumigant, G. M. Bentley (*Tenn. Bd. Ent. Bul. 18 (1916), pp. 12, figs. 5*).—Directions are given for the fumigation of nursery stock, including the construction of fumigating structures.

General treatise on entomology, T. Miyake (*Konchûgaku Hanron Jôkwan. Tokyo: Shōkābo, Nihonbashi, 1917; rev. in Science, n. ser., 46 (1917), No. 1179, pp. 113, 114*).—This work, dealing with the morphology, physiology, and embryology of insects, comprises the first part of a handbook on entomology. The review is by L. O. Howard.

Benefits to be derived from observing, collecting, and studying insects, G. M. Bentley (*Tenn. Bd. Ent. Bul. 20 (1917), pp. 32, figs. 22*).—A popular account.

The relation of soil insects to climatic conditions, A. E. Cameron (*Agr. Gaz. Canada, 4 (1917), No. 8, pp. 663–669*).—A general discussion of this subject.

How insects affect the cotton plant and means of combating them, W. D. Pierce (*U. S. Dept. Agr., Farmers' Bul. 890 (1917), pp. 27, figs. 36*).—This is a popular summary of information on cotton insects and means for their control.

Control of insect pests of sugar cane by fungi and bacteria, J. Groenewege (*Arch. Suikerindus. Nederland. Indië, 24 (1916), No. 51, pp. 2023–2033; Meded. Proefstat. Java-Suikerindus., 6 (1916), No. 18, pp. 531–541; abs. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 7, pp. 277, 278*).—The economic importance attributed to the control of insect pests by fungus and bacterial diseases is questioned by the author.

Notes on insect pests of green manures and shade trees, E. A. Andrews (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 3 (1915), pp. 57–62; No. 1 (1916), pp. 18–21*).—A summary of information on the insects which are found to attack green manure crops and shade trees on tea estates in northeast India.

Report of associate entomologist, G. M. Bentley (*Tennessee Sta. Rpt. 1914, pp. 282–284*).—This consists of a brief statement of the work under way during 1914, of which mention may be made of that with the strawberry root lice (*Aphis forbesi* and *Macrosiphum fragariæ*) which are rapidly becoming distributed over the State, one or the other infesting strawberry plants in 25 of the 96 counties. In several sections of the State the young are produced throughout the winter months, while in other sections the winter is passed in the egg stage. In control experiments the plowing under of infested plants and the selection of a field where strawberry plants have not recently been grown proved the most successful.

Report of the associate entomologist, G. M. Bentley (*Tennessee Sta. Rpt. 1915, pp. 126–128*).—A brief report is given of the work of the year with the more important insect pests, particularly aphidids.

The black peach aphis, which was very prevalent during the year, was found to be best controlled by the use of 40 per cent nicotin sulphate solution, reduced at the rate of 1 to 500, with 0.5 lb. laundry soap dissolved in each 3 gal. of the reduction. The rose chafer, which caused considerable injury to young peaches, eating from one-third to two-thirds of the fruit, was quite satisfactorily controlled by the use of 6 lbs. of arsenate of lead to 50 gal. of water, sweetened with 1 gal. sorghum. The ash-gray blister beetle, which occurred in swarms in parts of east Tennessee, caused considerable loss to alfalfa, soy beans, and cowpeas. It was disseminated by cutting the crop at the time of the attack, there being no known case of a second infestation occurring in the same field.

In experiments at the station apiary it was found that bees in double-wall hives come through the winter much stronger than those in the single-wall hives and with 25 per cent less honey required to feed them.

Forty-seventh annual report of the Entomological Society of Ontario, 1916 (*Ann. Rpt. Ent. Soc. Ontario, 47 (1916), pp. 174, figs. 52*).—Among the more important papers here presented are the following: Dusting Fruit Trees and Grapes for the Control of Diseases and Biting Insects, by L. Cæsar (pp. 31–43); General Notes on Aphids which Occur on Apple Trees, by W. A. Ross (pp. 43–49); Note on *Physonota unipuncta*, by A. F. Winn (pp. 50, 51); Preliminary Notes on the Use of Repellents for Horn Flies and Stable Flies on Cattle, by A. W. Baker (pp. 52–56); The Relation of Insects to Disease in Man and Animals, by L. O. Howard (pp. 57–62); Insects as Material for Studies in Heredity, by W. Lochhead (pp. 66–72); An Historical Account of the Forest Tent Caterpillar and of the Fall Webworm in North America, by A. B. Baird (pp. 73–87); Camp Hygiene, by G. J. Spencer (pp. 87–89); The Experimental Results in Apple Maggot Control, by W. H. Brittain (pp. 89–91); Experiments on the Control of Locusts with *Coccobacillus acridiorum*, by E. M. DuPorte and J. Vanderleck (pp. 91–95) (E. S. R., 37, p. 760); Some Features of Interest in Connection with Our Studies of Forest and Shade Tree Insects, by J. M. Swaine (pp. 95–106); Notes on Some Insects of the Season, by L. Cæsar (pp. 106–110); Three Important Greenhouse Pests Recently Introduced into Canada, namely, the Florida fern caterpillar (*Callopistria floridensis*), the chrysanthemum midge (*Diarthronomyia hypogæa*), and the rose midge (*Dasyneura rhodophaga*), by A. Gibson (pp. 111–122); Experiments in the Control of the Poplar and Willow Borer (*Cryptorhynchus lapathi*), by R. Matheson (pp. 122–132) (E. S. R., 37, p. 464); The Fruit Tree Leaf Roller in New York State, by G. W. Herrick (pp. 132–137); and the Entomological Record, 1916, by A. Gibson (pp. 137–171.)

Some injurious biting insects in Nova Scotia, A. G. Dustan (*Ann. Rpt. Fruit Growers' Assoc. Nova Scotia, 53 (1917), pp. 61–67*).—Brief notes are given on the brown-tail moth, which is said to be the most injurious pest in Nova Scotia; the dock sawfly (*Ametastegia glabrata*), first recognized as a serious pest in the winter of 1915–16; the leaf sewer (*Ancylis nubeculana*), widely distributed throughout the Province, which in one orchard during the previous season attacked 90 per cent of the leaves; the tussock moth, severe outbreaks of which occur once in every eight or ten years; and the cankerworm, which almost totally defoliated many orchards during 1915 and was even more injurious during 1916.

A year of Costa Rican natural history, Amelia S. and P. P. Calvert (*New York: The Macmillan Co., 1917, pp. XIX+577, pls. 82, figs. 7*).—This work includes reports of observations on insects of economic importance.

The insect association of a local environmental complex in the district of Holmes Chapel, Cheshire, A. E. Cameron (*Trans. Roy. Soc. Edinb., 52 (1917)*,

pt. 1, No. 2, pp. 37–78, pls. 2).—The subject is dealt with under the headings of physiography and topography, the plant environment and its relation to insects, physical factors of the environment, the insect association, and soil insect census.

[Insect pests of Madras] (*Madras Agr. Dept. Yearbook, 1917, pp. 76–99, pls. 8, fig. 1*).—Notes are included by T. V. Ramakrishna Ayyar on the life history and habits of the eye fly (*Siphonella funicola*) (pp. 76–83); a new pest of the coconut palm on the West Coast (*Contheyla rotunda*), which damages coconut trees in the Cochin State (pp. 91–96); and on the egg-laying habits of the agathi weevil (*Alcides bubo*), which attacks agathi, cluster beans, and indigo in South India and also the betel vine (pp. 97–99). Notes on the life history of *Megacœlum stramineum*, a pest of *Andropogon sorghum*, by E. Ballard (pp. 83–87) and on *Adisura atkinsoni*, a pest of *Dolichos lablab* throughout the Madras Presidency, which also attacks red gram to a small extent, by Y. Ramachandra Rao (pp. 87–91), are also included.

Termites in the Luskerpore Valley, E. A. ANDREWS (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 2 (1916), pp. 54–72, pls. 2, figs. 5*).—A report upon observations of the depredations of termites in the Luskerpore Valley of South Sylhet.

The life of the grasshopper, J. H. FABRE, trans. by A. TEIXEIRA DE MATTOS (*New York: Dodd, Mead & Co., 1917, pp. VIII+453*).—The translator here brings together the essays in the author's Souvenirs Entomologiques that treat of grasshoppers, crickets, locusts, the cicada, the mantis, the foamy cicadella, etc.

The sycamore lace-bug (Corythucha ciliata), O. WADE (*Oklahoma Sta. Bul. 116 (1917), pp. 16, figs. 7*).—The sycamore lace-bug here considered and the bagworm are about the only serious insect enemies of the western sycamore (*Platanus occidentalis*). This lace-bug is widely distributed throughout the United States, being the most common and probably the best known of the tingids. It appears to confine itself entirely to trees of the genus Platanus, being found throughout the range of the western sycamore. Observations made by the author in Oklahoma nurseries failed to show that it attacks the eastern plane tree (*P. orientalis*), though it is thought that the native species *P. wrightii* of Arizona and New Mexico and *P. racemosa* of California serve as hosts.

The injury is caused by both the young and adults, which suck the sap from the under surface of the leaves, the foliage being left in a whitish, deadened state. In common with all members of the family this lace-bug hibernates in the adult stage, usually under the loose, rougher bark of the host tree. Oviposition commences in March, the eggs being deposited along the larger ribs of the leaves, singly or in groups of as many as ten. One female under observation which began March 18 had laid 284 eggs up to the time of her death on June 9. The eggs hatch in from 14 to 21 days, averaging 15 days under optimum conditions. The five nymphal instars were found to average 3, 3, 4, 5, and 5 days, respectively.

Technical descriptions are given of the several stages of the species and their distinguishing characteristics are pointed out.

Mention is made of several predatory enemies. A test made of several insecticides, including kerosene emulsion, fish-oil soap, and nicotin sulphate, showed that a fish-oil soap solution consisting of fish-oil soap 1 lb. to water 6 gal. is the most practical and effective, and when carefully applied with a good spraying apparatus it should be as cheap or cheaper than the other solutions tested.

The beet leaf-hopper and the curly leaf disease that it transmits, E. D. Ball (*Utah Sta. Bul. 155* (*1917*), *pp. 3–56, figs. 32*).—This is a summary of the present status of knowledge of the beet leaf-hopper and the curly leaf disease, including the author's investigations, presented in connection with a bibliography of 20 titles.

It is pointed out that punctures of the beet leaf-hopper cause this specific disease of sugar beets and that it has never been produced except through the punctures of a beet leaf-hopper. The conclusion that it is transmitted by the beet leaf-hopper has been confirmed by several investigators. "If a single leaf-hopper is applied to a beet for five minutes, the curly leaf disease will appear after about two weeks, if conditions are favorable. Cold, wet weather will stop the development of further symptoms of curly leaf on a slightly diseased plant or prevent their development on a previously healthy one, even if a number of leaf-hoppers are kept thereon. . . . Leaf-hoppers taken from wild plants did not transmit the disease until they fed on diseased beets. Three hours on a beet rendered them pathogenic, but they could not transmit until after an incubation period of one or two days. It is probable that some wild plant carries the disease, and leaf-hoppers coming from this plant are able to transmit it to the beets.

"A large number of leaf-hoppers, early attack, hot weather, and clean cultivation are favorable to curly-leaf development. The converse of these factors, together with frequent cultivation, early irrigation, and shade or weeds are unfavorable. Seed growing is doubly hazardous in curly-leaf areas. Loss from curly leaf may be largely prevented by avoiding dangerous areas, by planting small acreages in a 'blight cycle,' by time of planting, by not thinning just as the leaf-hoppers appear, and by knowledge of conditions on breeding grounds. Parasites doubtless assist somewhat in controlling the leaf-hopper, but to be at all effective should be introduced into the permanent breeding grounds. The outlook for the immediate future in the intermountain and coast regions is favorable; for the plains region, doubtful; and for the Glendale, Tulare, and Columbia-Snake River region, serious."

Mango hopper control experiments, E. Ballard (*Agr. Jour. India, 10* (*1915*), *No. 4, pp. 395–398*).—*Idiocerus niveosparsus* is the cause of great annual loss to mango growers of Chittoor and Salem, a really severe attack resulting in the total loss of the crop and the greatly diminished vitality of the trees. Upon emerging from the egg the young hoppers feed at once upon the leaf or flower shoots. In a badly attacked mango grove the trees are covered with their honeydew, the flower shoots blacken and wither, and no fruit is set.

In control experiments fish-oil soap appeared to be superior to crude oil emulsion 1:10, and cheaper. The results of spraying experiments on 55 trees, presented in tabular form, indicate that spraying is profitable.

Mango hopper control, P. J. Wester (*Philippine Agr. Rev.* [*English Ed.*], *9* (*1916*), *No. 2, pp. 159, 160; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 7* (*1916*), *No. 12, p. 1862*).—In briefly reviewing the article by Ballard above noted relating to the control of *Idiocerus niveosparsus* in India, the author calls attention to the fact that more or less damage is done annually to the mango crop in the Philippines by *I. niveosparsus* and *I. clypealis*. In some years in certain districts the entire crop is destroyed.

Insecticide spraying for the mango hopper, T. V. Ramakrishna Ayyar (*Madras Agr. Calendar, 1917–18, pp. 72–74, figs. 2*).—A brief account is given of the control work of the previous year with the mango leaf hopper. Quite satisfactory results were obtained from the use (1) of crude oil emulsion and (2) of fish-oil rosin soap, both used at the rate of 1 lb. to 10 gal. of water. It

was found that at a cost of 8 annas (16 cts.) per tree the crop could be saved and clear profits made.

The mango hopper pest and its control, T. V. RAMAKRISHNA AYYAR (*Dept. Agr. Madras Leaflet 3 (1917), pp. 6, figs. 2*).—A more detailed account than that noted above.

The present status of our knowledge of the homopterous fauna of Formosa, F. SCHUMACHER (*Mitt. Zool. Mus. Berlin, 8 (1915), No. 1, pp. 71–134*).—This paper lists 325 species of Homoptera from Formosa, of which 2 genera and 9 species are described as new to science. A bibliography of 38 titles relating to the subject is included.

Silk.—Replies from commissioners of customs to inspector general's circular No. 103, second series, to which is added Manchurian tussore silk (*Shanghai, China: Insp. Gen. Customs, 1917, pp. VII+212, pls. 42*).—This is a reprint of a report relating to the production and manufacture of silk in China, published in 1881, to which is added an extended account by N. Shaw of Manchurian tussore silk and a list of the books consulted (pp. 163–199). The paper by Shaw gives an account of the saturnid silkworm *Antheræa pernyi*, including descriptions of its several stages, life history and habits, and food plants, which consist of species of oak (*Quercus dentata, Q. aliena, Q. mongolica*, etc.), cultivation and care of trees, a detailed statement on rearing the worms, predacious enemies, and diseases.

The other 23 varieties of silk-producing moths that occur in Manchuria are said to be quite unimportant commercially.

[Antler moth (Charæas graminis) infestation] (*Jour. Bd. Agr. [London], 24 (1917), No. 5, pp. 514–526, pl. 1*).—A report on an infestation of larvæ of the antler moth (*C. graminis*) in the Peak District, by A. C. Cole and A. D. Imms (pp. 514–522), and an account of an invasion of the caterpillars of the antler moth into Yorkshire, by J. Snell (pp. 523–526), are given.

The codling moth in 1916, P. A. GLENN (*Trans. Ill. Hort. Soc., n. ser., 50 (1916), pp. 197–214, pls. 7*).—This is a report of investigations carried on in continuation of those of the previous year (E. S. R., 36, p. 853) at stations located at Ozark, Olney, Plainview, and Springfield, Ill. A large third generation was found to occur at all the stations and probably as far north as Dixon, though at that place it must have been too small to be of importance. The second generation at Olney was much larger in proportion to the first generation of 1916 than during the previous year. The third generation of 1916 was almost as large as the second.

Data relating to life history studies are accompanied by a diagram which graphically illustrates the seasonal history of the codling moth, an average daily temperature about 50° F., and the monthly rainfall at Olney in 1916, showing the dates when each of the three generations of pupæ, adults, eggs, and larvæ began and ended, and the relative number of individuals appearing each day. The mean monthly temperatures at Olney for the growing months of 1915 and 1916 and of a normal year are also charted.

By the use of the first of the two tables given it can be determined when larvæ of the first generation will be hatching out. This table gives the date of emergence of the moths and the dates when the first larvæ, maximum number of larvæ, and last larvæ from the eggs of these moths appeared in 1915 and 1916. By collecting 200 or 300 larvæ early in the spring, or better the preceding fall, and placing them in a cage in the orchard or yard so that they will be under the same conditions as to heat and moisture as those left on the trees, and by examining the cage daily after April 20, the date when the first moths emerge can be readily ascertained. Then by consulting the table the observer will find when the eggs

from the moths which emerged on that date hatched in 1915 and 1916 and will know approximately when to expect the first larvæ in his orchard.

In the second table are shown the dates when the larvæ of the first generation left the apple and the date when the first larvæ descending from them hatched out in 1915 and 1916. By banding a dozen or more trees not later than June 1 and examining the bands daily or at intervals of three or four days and consulting the table when larvæ are found, the fruit grower may be advised beforehand when and in what relative numbers the larvæ of the second generation will be hatching in the orchard long enough beforehand to protect the crop.

Syrphidæ of Maine.—II, Life history studies, C. L. Metcalf (*Maine Sta. Bul. 263 (1917), pp. 153–176, pls. 5*).—In this continuation of the studies previously noted (E. S. R., 36, p. 460) the author reports upon the biology and economic status of four additional species, all of which are aphidophagous. The species considered are *Xanthogramma divisa*, *Syrphus oronoensis* n. sp., *Platychirus perpallidus*, and *S. knabi*. *S. oronoensis* appears to be an important predator of aphids affecting stone fruits, *X. divisa* and *S. knabi* are, so far as observed, of more benefit to certain shade and forest trees, while the chosen food of *P. perpallidus* has not been determined. The latter species is of faunistic interest, since it has not hitherto been recorded outside of Great Britain. The author has also obtained several European species of Platychirus in Maine, namely, *P. scutatus*, *P. immarginatus*, *P. discimanus*, and *P. angustatus*.

Attention is called to the fact that Platychirus and Xanthogramma, previously recorded as having species which are scavengers in the larval stage, should be added to the list of ten genera given in the bulletin, previously noted, as aphidophagous, at least in part.

"El tórsalo" (Dermatobia cyaniventris), J. M. Arias G. (*El Tórsalo (Dermatobia cyaniventris). San Jose, Costa Rica: Dept. Agr., 1917, pp. 19, figs. 6*).—An account of this oestrid, called "el tórsalo" by the author, the larvæ of which develop in the skin of man, in tropical America.

Studies upon the common house fly (Musca domestica), I, II, J. R. Scott (*Jour. Med. Research, 37 (1917), No. 1, pp. 101–119, 121–124*).—Two studies are reported.

I. *A general study of the bacteriology of the house fly in the District of Columbia.*—This is a detailed report upon the bacterial flora of house flies collected in various sections of the city of Washington.

"House flies show seasonal variation in the number of bacteria carried as well as in the species of bacteria. The seasonal variation shows the greatest bacterial flora is coincident with the summer months, and the occurrence of intestinal complaints of summer and early autumn. The isolation of members of the colon-typhoid-dysentery group of bacilli from numbers of flies indicates that the house fly has the power of carrying the closely allied pathogens, typhoid and dysentery. The finding of virulent pyogenic cocci indicates the possibility of the common house fly being a factor in the dissemination of the suppurative processes.

"The results of my experiments indicate that typhoid fever in the District of Columbia, under normal conditions, is not referable to the agency of the house fly."

II. *The isolation of B. cuniculicida, a hitherto unreported isolation.*—In the course of the investigations above noted, the causative organism (*Bacillus cuniculicida*) of a septicemia in rabbits and guinea pigs was obtained from two flies. This appears to be the first reported instance of its isolation from the house fly.

"This recovery of *B. cuniculicida* may indicate at least one manner in which the bacillus is carried to pens of healthy experimental animals, and demon-

strates the necessity for proper screening of windows and doors of rooms where experimental animals are kept. It particularly indicates the necessity for keeping experimental animals inoculated with pathogenic organisms protected from the house fly."

Flies and bacillary enteritis, W. NICOLL (*Brit. Med. Jour., No. 2948 (1917), pp. 870–872*).—Continuing a discussion of flies in disease transmission (E. S. R., 37, p. 854), the author shows that organisms producing bacillary enteritis are to be met with not infrequently in flies under natural conditions, that a considerable number of organisms resembling enteritis bacilli occur frequently in flies in the natural state, and that the utmost care is necessary in discriminating between these and the true enteritis-producing organisms.

A note on the rice field fly (Ephydra macellaria) (*Bul. Soc. Ent. Egypte, 9 (1916), No. 4, pp. 102–105*).—The author is of the opinion that this fly, which is frequently accused by farmers of causing the death of rice over considerable areas in the northern part of Lower Egypt, is a secondary invader rather than the cause of the death of young rice. Its food appears to consist of dead and decaying vegetable matter and possibly living algæ.

Fleas and their control, F. C. BISHOPP (*U. S. Dept. Agr., Farmers' Bul. 897 (1917), pp. 15, figs. 6*).—This is a revision of Farmers' Bulletin 683, previously noted (E. S. R., 34, p. 159).

Three-lined fig-tree borer, J. R. HORTON (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 8, pp. 371–382, pls. 3*).—This is a report of studies made of *Ptychodes trilineatus*, a cerambycid which is the source of considerable injury to fig trees (*Ficus carica*) in the Southern States through boring into the larger branches and trunks. It is not, however, the only borer attacking fig trees in the Southern States, mention being made of *Leptostylus biustus*, *Goes* sp., *Stephanoderes* sp., and *Ataxia crypta*, all of which were found working in the same trees with *P. trilineatus*.

This fig borer is known to occur throughout the Southern States from Florida to Houston, Tex., and from South Carolina to the Gulf. It has also been reported from parts of Mexico, several of the Central American countries, the West Indies, South America, and Tahiti.

The greatest amount of damage is caused by the larvæ, although the adult beetle causes some injury by feeding upon the fruit, leaves, and bark and by ovipositing in the bark. The larva mines its way into the larger branches and trunks of the tree where it feeds upon the wood for from three months to more than one year. The borers live in both dry and green wood but seem to prefer wood that is partly dead and has lost some of its sap. The favorite points of attack are near wounds made by the breaking of large limbs, untreated saw cuts, splitting of the trunk, the knots formed in the branches by fig canker, injuries in the bark, etc. The author finds that fig trees kept in a thriving healthy condition are less subject to severe attacks by this borer.

The eggs, which are deposited by insertion into the bark of the larger branches and trunk, hatch in from 3 to 8 days, with an average of 5.6 days. On hatching out the young borer mines its way along through the bark for several days, then tunnels into the solid wood, and often eats its way to the very heart of the branch. It lives and feeds in this manner for from 2 to 15 months. About two-thirds of the borers complete the larval stage in the season in which the eggs are deposited, while the remaining third live through the winter and pupate the following season. The single-season larvæ require approximately from 2 to 4.5 months to complete their larval life, and the overwintering borers from 7.5 to 15 months, with an average of 3 months, the average life in the wood being 11½ months.

There is a wide variation in the number of molts, a little more than half of those under observation having molted only 5 or 6 times, about one-fourth of them molting 8 times, and the remaining fourth, 4, 7, 9, and 10 times. It is pointed out that there is also a wide variation in the duration of the larval instars.

The duration of the pupal stage, which is passed entirely within the sawdust cell constructed by the borer in its tunnel in the wood, is also quite irregular, varying from 5 to 73 days, with an average of 24 days for the 70 specimens observed. The longevity of the adult varied for the 24 specimens observed from 75 to 222 days. It was found that a single female will deposit from 100 to 184 eggs in the course of its life, at an average rate of from 1 to 2.4 eggs per day.

It is pointed out that the most important control measure is that of keeping the trees in the healthiest condition possible. Trees of which the trunks are badly infested should be cut down and burned as it is practically impossible to save them and they will serve as a source of infestation and a menace to the healthy trees. In some cases the borers may be killed by injecting carbon bisulphid into the tunnels and plugging the opening with putty, but this method is impractical where the infestation is severe and well advanced.

[Report on the banana borer in Mayumba], R. Mayné (*Bul. Agr. Congo Belge. 7 (1916), No. 3-4, pp. 236-239, fig. 1*).—The curculionid *Cosmopolites sordida*, the larva of which bores in the trunk, has resulted in a great decrease in bananas in certain regions of Mayumba. Accounts of this pest in Fiji by Jepson (E. S. R., 35, p. 57) and in Jamaica (E. S. R., 37, p. 161) have been noted.

Injurious British weevils, H. Bastin (*Jour. Bath and West and South. Counties Soc., 5. ser., 11 (1916-17), pp. 56-81, pls. 8*).—The author here brings together in small compass the known facts relative to the life histories of British weevils and notes on the various methods employed in their control.

Bees and their management, W. Herrod-Hempsall (In *Live Stock of the Farm. London: The Gresham Pub. Co., 1916, vol. 6, pp. 1-63, pls. 3, figs. 13*).—A summary of information on beekeeping.

The structure and life history of Bracon sp.: A study in parasitism, J. W. Munro (*Proc. Roy. Soc. Edinb., 36 (1915-16), No. 3-4, pp. 313-333, pls. 2*).—This paper deals with an important braconid parasite of the brown pine weevil (*Hylobius abietis*), the worst insect pest of forestry in Scotland, which is thought to be *Bracon hylobii*. In laboratory work three broods were reared during the summer and no hyperparasites observed. The parasite has been found in nine counties of Scotland, showing a wide and probably general distribution and indicating that it is probably present wherever *H. abietis* occurs in numbers. A preliminary account has previously been noted (E. S. R., 32, p. 852).

Italian entomological fauna.—Hymenoptera: Formicidæ, C. Emery (*Bul. Soc. Ent. Ital., 47 (1915), No. 1-4, pp. 79-275, figs. 92*).—A synopsis of the Italian species.

Further investigations on the economic importance of the Gramang ant, P. van der Goot (*Meded. Proefstat. Midden-Java, No. 22 (1916), pp. 120, pls. 6; abs. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 7, pp. 273-276*).—A report of further studies of *Plagiolepis longipes* in Java (E. S. R., 35, p. 467), and particularly of control measures. An account of the green scale (*Coccus viridis*) and its natural enemies is appended (pp. 68-91).

The silverfish or "slicker," an injurious household insect, E. A. Back (*U. S. Dept. Agr., Farmers' Bul. 902 (1917), pp. 4, figs. 2*).—This supersedes Farmers' Bulletin 681, previously noted (E. S. R., 33, p. 459).

Notes on mites attacking orchard and field crops in Utah, R. W. Doane (*Science, n. ser., 46 (1917), No. 1182, p. 192*).—During the summers of 1915 and 1916 the author found certain mites to be particularly abundant and destructive to grains in Utah. Of these the red spider mite (*Tetranychus bimaculatus*) was the most important. Of the field crops corn suffered the most and many wheat fields sustained considerable losses as a result of its attack. During 1916 it was also injurious to fruit trees, bush fruits, truck crops, and sugar beets as well as ornamental plants. Earlier in the season wheat plants were attacked by the clover mite and *Tetranobia longipes*, both of which were also destructively abundant on barley, oats, and many wild grasses.

Studies on North American Polystomidæ, Aspidogastridæ, and Paramphistomidæ, H. W. Stunkard (*Ill. Biol. Monographs, 3 (1917), No. 3, pp. 114, pls. 11*).—This paper contains the results of a study of the structure and classification of North American representatives of trematodes of the families Polystomidæ, Aspidogastridæ, and Paramphistomidæ. Seven species are described as new. A bibliography of 109 titles is included.

FOODS—HUMAN NUTRITION.

The American papaw and its food value, C. F. Langworthy and A. D. Holmes (*Jour. Home Econ., 9 (1917), No. 11, pp. 505–511*).—Data are summarized regarding the papaw, a native wild fruit with pronounced flavor, which has always been gathered and eaten in regions where it grows, but which, owing perhaps to difficulties in shipping, has been marketed only in a limited way. Although cases of illness have been attributed to eating the papaw, there seems to be no definite evidence to indicate that it is other than wholesome.

Tables are included reporting the weight of fruit, seeds, skin, and pulp of 10 specimens, the pulp averaging 74.8 per cent. The edible portion as analyzed contained 76.6 per cent water, 5.2 per cent protein, 0.9 per cent of fat, 16.8 per cent carbohydrates, and 0.5 per cent ash. The carbohydrates contained 16 per cent sucrose and 35 per cent reducing sugar. The fuel value was 435 calories per pound.

Although very generally eaten out of hand or as a table or dessert fruit, some attempts have been made to use the papaw in cookery. The tests made in connection with the study reported have led to the conclusion that the flavor of the fruit is not improved by the action of heat in cooking, but rather the reverse. Good results, however, were obtained when fresh papaw pulp was used in making a frozen cream.

Home preparation of breakfast foods and flour from whole grain, G. A. Olson (*Washington Sta. Bul. 112 (1917), pp. 15, figs. 8*).—Directions are given for the preparation of various wheat and corn products as well as combinations with flax seed and legumes.

Vinegar investigation.—A study of the changes that cider undergoes during fermentation and prolonged storage and its subsequent conversion into vinegar in rotating generators, B. G. Hartman and L. M. Tolman (*Jour. Indus. and Engin. Chem., 9 (1917), No. 8, pp. 759–762*).—Analyses show that during fermentation a large part of the malic acid of the apple juice is changed to lactic acid, which is the chief fixed acid of vinegar. The remaining malic acid is almost entirely oxidized during acetification. Acetates are present in the vinegar and there are indications of minute amounts of formic acid. Potassium carbonate makes up 75 per cent of the ash.

Food value of the fresh and pickled herring, T. H. Milroy (*Roy. Soc. [London], Food (War) Com., 1917, Aug. 9, pp. 4+3*).—This comprises analyses and

methods of packing. A brief report on smoked herrings, by T. W. Fulton, is included.

The Bureau of Markets in its relation to the conservation of foods, C. J. BRAND (*Jour. Indus. and Engin. Chem.*, *10* (*1918*), *No. 1*, *pp. 66–69*).—This includes a statement of the food situation here and abroad, and an account of the food surveys now being made by the Bureau of Markets. Two inventories are being made, one preliminary and the other more comprehensive. The work will cover the stocks on hand on farms; in wholesale, jobbing, storing, manufacturing, retail, and other commercial establishments; and consumers' stocks, consumption records, and a dietary study. In the dietary survey the Office of Home Economics of the States Relation Service is cooperating.

Rules and regulations of the Secretary of Agriculture under the food products inspection law of August 10, 1917 (*U. S. Dept. Agr., Office Sec. Circ. 82* (*1917*), *pp. 8*).—The text of these rules and regulations is given.

Experiments in teaching food values (*Univ. Ill. Bul.*, *14* (*1917*), *No. 49*, *pp. 22*).—The bulletin includes menus for different seasons of the year, a study of the dietary habits of cafeteria patrons, meals for nine days and their costs in 1917, and a lesson in buying food.

Human food, considered in its relation to quantity and cost, A. McGILL (*Lab. Inland Rev. Dept. Canada Bul. 377* (*1917*), *pp. 16*).—The terms calories, protein, fat, and carbohydrates are explained and the food requirements of various individuals discussed. Tables are included showing the quantity of protein, fat, and carbohydrates in a pound of the most common foods and their cost per pound in Ottawa in June, 1917. Directions are also given on how to calculate dietaries.

Fats and oils in cookery.—Cooking temperatures, ANNA W. WILLIAMS and CORA E. GRAY (*Univ. Ill. Bul.*, *14* (*1917*), *No. 47*, *pp. 19*).—A popular treatise on the properties of fat, the value of fat as food, and the uses of different kinds in cooking.

On the presence of albumoses in the tissues and in the blood, with special reference to their occurrence in the gastro-intestinal mucosa, J. J. ABEL, M. C. PINCOFFS, and C. A. ROUILLER (*Amer. Jour. Physiol.*, *44* (*1917*), *No. 3*, *pp. 320–343*).—The authors report that albumoses can be isolated in varying amounts from the tissues of the body, including the cellular elements of the blood. No proteoses were separated from the plasma of the blood. Chemical procedures for the preparation of the albumoses from the gastric or intestinal mucosa, which is entirely devoid of pharmacological activity, are given. The gastro-intestinal mucosa contained from three to five times as much albumoses during the digestion of meat as after the deprivation of all food (except water) for four days.

The authors conclude that proteoses, as well as amino acids, are absorbed by the surfaces of the digestive apparatus. They were not able to trace the passage of proteoses from the mucosa to various organs via the blood current.

A bibliography is appended.

The production in dogs of a pathological condition which closely resembles human pellagra, R. H. CHITTENDEN and F. P. UNDERHILL (*Amer. Jour. Physiol.*, *44* (*1917*), *No. 1*, *pp. 13–66*).—Dogs fed on boiled peas, cracker meal, and cottonseed oil rapidly developed symptoms of abnormal nutrition. The failure to thrive upon the dietary was not due to the low nitrogen intake, per se, since a higher level of intake did not prevent the onset of pathological changes though it delayed their appearance. The abnormalities were almost entirely confined to the alimentary canal and could be made to disappear by the addition of meat to the dietary, but if the meat content was reduced to an undefined limit the characteristic symptoms appeared and death eventually followed.

There was excellent utilization of the food. In the essential features the pathological manifestations closely resembled those observed in human pellagra. The authors conclude that it seems tenable that the abnormal state may be referred to a deficiency of some essential dietary constituent, presumably belonging to a group of hitherto unrecognized but essential components of an adequate diet.

ANIMAL PRODUCTION.

A manual of Mendelism, J. Wilson (*London: A. & C. Black, Ltd., 1916, pp. [8]+152, figs. 8*).—A description of Mendel's law and deductions drawn therefrom. Various experiments in both plant and animal breeding are cited and discussed in their relation to Mendel's law. Practical suggestions are made to scientific breeders that should prove of value in their work.

Some applications of mathematics to breeding problems, R. B. Robbins (*Genetics, 2 (1917), No. 5, pp. 489–504*).—In this paper, which deals only with a single pair of typical Mendelian factors, the author (1) gives some examples to show the use of the methods of mathematical induction and repetition in the suggestion and establishment of formulas, (2) expresses the nth term of one of Jennings's series (E. S. R., 34, p. 764) as a function of n, and (3) proposes a solution of the problem of inbreeding by brother and sister mating.

Dominance of linked factors as a means of accounting for heterosis, D. F. Jones (*Genetics, 2 (1917), No. 5, pp. 466–479, fig. 1*).—In this discussion of heterosis the author states that, on account of linked factors, the complete dominant or complete recessive can never or rarely be obtained.

"From the fact that partial dominance of qualitative characters is a universal phenomenon and that abnormalities are nearly always recessive to the normal conditions, it is possible to account for the increased growth in F_1 because the greatest number of different factors are combined at that time. It is not necessary to assume perfect dominance. It is only necessary to accept the conclusion that many factors in the $1n$ condition have more than one-half the effect that they have in the $2n$ condition. This view of dominance of linked factors as a means of accounting for heterosis makes it easier to understand (1) why heterozygosis should have a stimulating rather than a depressing or neutral effect, and (2) why the effects of heterozygosis should operate throughout the lifetime of the individual, even through many generations of asexual propagation."

The study of certain dietary conditions bearing on the problem of growth in rats, C. Funk (*Jour. Biol. Chem., 27 (1916), No. 1, pp. 1–14, figs. 4*).—The results reported note the influence of several specific substances which not only might add to the nutrition but also correct deficiencies in diet. The observations were made during a period of nearly two years' work with several hundred rats.

Dry or germinated oats, with sodium bicarbonate or alone, proved an unsuccessful diet for young rats. The quantity of vitamins necessary in their diet is not small. One per cent of yeast added to the ration is not enough; 3 per cent at least is necessary. While yeast can be regarded as a complete food in itself, replacing the total casein nitrogen by yeast nitrogen was not so satisfactory as using yeast in smaller amounts for its vitamin content rather than for its nutritive value. The substitution of orange juice for yeast gave no results. The growth was less when milk was used instead of yeast. The use of Lloyd's reagent did not give complete precipitation of the growth-promoting substances, while the yeast lost some of its properties as a stimulant to growth.

The Scandinavian methods of valuing and using feeding stuffs, J. Wilson (*Dept. Agr. and Tech. Instr. Ireland Jour., 17 (1917), No. 2, pp. 208–217*).—The

methods discussed involve a return to those of the earliest German investigators, where one feed is fed against another in a standard ration. The results are expressed comparatively with one food used as a basis, as barley. The tables of comparative values are estimated for different classes of animals.

In the actual practice of feeding, further economies are found in basing the ration upon the gains sought, the work to be done, and the milk yield. In the last case, for example, the ration is based upon the weight of the cow, and the daily yield of milk.

Feeding stuffs, F. J. LLOYD (*Jour. Brit. Dairy Farmers' Assoc., 31 (1917), pp. 119–129*).—A paper presented by the chemist of the association containing a résumé of the value of feeding stuffs and directions for purchasing them to the best advantage for individual needs.

The composition of some South Indian foodstuffs and fodders, W. H. HARRISON (*Madras Agr. Dept. Yearbook, 1917, pp. 62–72*).—A long list of fodders analyzed is given. Among those mentioned are *Eleusine coracana*, *Pennisetum typhoideum*, *Cicer arietinum*, *Phaseolus mungo radiatus*, *P. aconitifolius*, *Cajanus indicus*, *Dolichos biflorus*, *D. lablab*, *Sesamum indicum*, Guinea grass, spineless cactus, and Teff grass hay.

The feeding value of the hay of seed vetch and cleaned vetch, J. GRÓH and I. D. GÖTZ (*Kisérlet. Közlem., 19 (1916), No. 2, pp. 387–390*).—In a trial with two sheep, it was found that with a water content at 12 per cent the seed vetch hay contained 8.1 per cent digestible protein and 36.8 per cent nitrogen-free extract; the cleaned vetch hay, 101.1 protein and 37.8 nitrogen-free extract.

Observations on silage, A. W. OLDERSHAW (*Jour. Bd. Agr. [London], 23 (1917), No. 11, pp. 1063–1072, pl. 1*).—A discussion of methods of ensiling practiced in East Anglia, with a description of the more modern types of silos that should be used.

The leaves and crowns of sugar beets as feed, L. MALPEAUX (*Vie Agr. et Rurale, 6 (1916), No. 48, pp. 386–390*).—A compilation and discussion of results of feeding beet tops fresh, dried, and ensiled.

Sugar beet leaves as cattle feed, E. SAILLARD (*Vie Agr. et Rurale, 7 (1917), No. 38, pp. 207, 208, fig. 1*).—A description of the practice of ensiling sugar beet residues in France, together with analyses of ensiled pulp and leaves.

Commercial feeding stuffs, A. J. PATTEN, E. F. BERGER, E. A. DE WINDT, and A. E. SMOLL (*Michigan Sta. Bul. 279 (1917), pp. 3–66, figs. 8*).—This contains the text of the new feeding stuffs law becoming operative April 1, 1918, and analyses of various brands of commercial feeding stuffs, including cottonseed meal and feed, linseed meal, distillers' dried grains, brewers' dried grains, corn gluten feeds, hominy feeds, corn meal, tankage, granulated bone, meat scrap, alfalfa meal, wheat bran and middlings, pea bran, barley bran, and proprietary feeds.

A smaller number of samples were analyzed this year than last, due probably to the scarcity of feeding stuffs on the market. Of the 837 samples analyzed 16.2 per cent were below guaranty in protein or fat, this number of deficiencies being 4 per cent below that found last year, while 15.4 per cent had an excess of crude fiber over the guaranty. A large amount of weed seed was found in scratch feeds for poultry, some of which were very objectionable. One sample containing seeds of night-shade was fed to hens, all of which were affected, two dying.

Attention is called to the use in feeding stuffs of by-products from palm oil manufacture, copra oil meal, and cacao shells.

Analysis of feeding stuffs, B. E. CURRY and T. O. SMITH (*New Hampshire Sta. Bul. 184 (1917), pp. 16*).—During the year 302 samples of feeds were col-

lected and analyzed. The percentage of ash and moisture was determined and carbohydrates estimated by difference.

The feeds examined included wheat middlings, bran, low-grade flour, cottonseed meal, hominy feed, molasses feeds, miscellaneous compounded feeds, alfalfa and clover meals, dried beet pulp, brewers' and distillers' grains, gluten feeds, linseed meal, meat and bone feeds, oat feeds, and provenders.

Feeding stuffs report, 1915, J. W. KELLOGG (*Penn. Dept. Agr. Bul. 280 (1916), pp. 271*).—The usual chemical and microscopical examination of samples collected under the act regulating the sale of concentrated commercial feeding stuffs is reported. The analyses include cottonseed meal, linseed meal, coconut oil meal, corn oil meal, ivory nut meal, distillers' dried grains (from corn and rye), yeast dried grains, brewers' dried grains, malt sprouts, corn gluten feed, corn gluten meal, hominy feed, corn bran, corn feed meal, low-grade flour, wheat middlings, wheat bran, rye middlings, oat feed, oat hulls, buckwheat middlings, buckwheat feed, alfalfa meal, dried beet pulp, various mixed and proprietary feeds, animal by-products, and condimental stock and poultry feeds.

Commercial feeding stuffs, 1916–17, [and] Texas feed law, B. YOUNGBLOOD (*Texas Sta. Bul. 216 (1917), pp. 5–385*).—This contains the text of the law regulating the sale of feeding stuffs in Texas and an explanation and discussion of its requirements, together with a list of manufacturers and tables of analyses of feeding stuffs examined, including alfalfa meal, blood meal, corn chop, corn gluten feed, ground corn cob, corn bran, cottonseed cake, cottonseed meal, cottonseed feed, cold-pressed cotton seed, dried beet pulp, dried brewers' grains, ear corn chop, feterita chop, hominy meal, Kafir corn chop, linseed meal, meat meal, milo maize chop, ground oats, ground oat hulls, peanut meal, peanut cake, whole pressed peanuts, ground peanut hay, ground bone, rice bran, rice polish, ground rice hulls, tankage, wheat bran, wheat shorts, and various mixed and proprietary feeds.

[Animal husbandry work], C. N. ARNETT (*Montana Sta. Rpt. 1916, pp. 170–172*).—The animal husbandry department has, owing to economic conditions, given special attention to the utilization of cheap feeds.

Thirty head of high-grade beef cattle were divided into two lots, one wintered on straw alone and the other on straw with the addition of 8.8 lbs. of hay per head daily. The results showed that when cattle start in in good condition in the fall they can be wintered on straw. In this experiment the cattle receiving the hay as part ration were in better condition than those receiving straw alone.

In a trial with fattening two lots of yearling cattle the results were not conclusive, but indicate that it is more profitable to feed less grain and more hay than is the practice in many sections. Feeding Giant Russian sunflowers to dairy cattle for a short period (nine days) indicated that this crop, which gave a yield of 22 tons per acre without irrigation, was equal pound for pound to corn and clover.

In growing and fattening pigs the results indicated that a light grain ration fed to pigs on forage is a profitable practice. As supplements to barley and wheat, animal products, skim milk and tankage, gave better results than peas and alfalfa, while the peas were slightly more efficient than the alfalfa.

Report of the animal husbandman, C. A. WILLSON (*Tennessee Sta. Rpt. 1913, pp. 153–155*).—During the year the station had 48 experimental groups of cattle and hogs, among them 328 steers. The rations tested have been mainly cottonseed products and silage. As in previous reports medium rations of cottonseed meal have given more economical returns than large rations. Silage was more efficient than cottonseed hulls.

An experiment was carried out with 15 pigs in lots of 3 each, testing the effect of iron salts when fed with cottonseed meal as suggested by the North Carolina Station. In lot 1, fed on corn meal and cottonseed meal (4:1), the pigs made practically no gains. In lot 4, fed on corn meal and cottonseed meal (2:1), two of the pigs died and the other, like the animals in lot 1, became very much emaciated. The pigs in lot 2, fed on corn meal and cottonseed meal (4:1) and 1 lb. of iron sulphate for every 50 lbs. of cottonseed meal, lot 3 with the same except that 1 lb. of iron chlorid was given instead of iron sulphate, and lot 5 on corn meal and cottonseed meal (2:1) and 1 lb. iron chlorid made good gains and were not detrimentally affected by the ration.

Feeding experiments with cattle, sheep, and pigs (*County Northumb. Ed. Com. Bul. 23 (1916), pp. 3–26*).—Several experiments of special value to the locality in which they were carried out are reported.

In an experiment comparing the value of bran and dried brewers' grains, 24 cattle 18 months old were fed for 16 weeks in four lots. Lots 1 and 2 consisted of bullocks, while lots 3 and 4 consisted of heifers. Standard rations containing soy cake and Bombay cotton cake were fed lots 1 and 3, while a ration of bran and sufficient soy cake to bring the digestible constituents up to the standard was fed lot 2, and a ration of dried brewers' grains and soy cake was fed lot 4. The bullocks receiving the cake ration made an average gain per head of 15⅓ lbs. per week, while those receiving bran made an average gain of 16¾ lbs. per week. As bran was a higher priced feed, the cost of the gains with bran was higher than with soy cake. The heifers receiving the cake ration made an average gain of 11½ lbs. per week, while those receiving dried brewers' grains made an average gain of 12 lbs. per week. The economic results, however, were favorable to the cake ration.

A similar experiment was carried out with sheep in 3 lots of 16 each. Lot 1, receiving cake alone, gained an average of 1.93 lbs. per head weekly; lot 2, receiving bran, gained 1.95 lbs.; and lot 3, receiving dried brewers' grains, 1.98 lbs.

The above experiments showed little difference in the feeding values of the same amounts digestible constituents in the different feeds used.

In an experiment to determine the feeding value of swedes and yellow turnips, 24 calves were divided into 3 lots, lot 1 consisting of 12 calves and lots 2 and 3 of 6 each. Lot 1 received no roots, but was given enough hay and concentrates to supply the same amount of nutrients as was received by lot 2, with swedes in the ration, and lot 3 with yellow turnips. The calves fed on hay and concentrates gained an average of 6.7 lbs. each per week, those on swedes 6.7 lbs., and those on yellow turnips 6.5 lbs. It appears that swedes and yellow turnips are of substantially equal value for the same amounts of dry matter.

"It has now been demonstrated for four winters in succession that young cattle from six to twelve months old can be wintered with excellent results on pasture, if they have access to a shelter shed and receive suitable additional food to the pasture. At the end of the winter those wintered outside have better coats of hair and will command higher prices as grazing cattle. They also possess the great advantage of practical freedom from tuberculosis."

In a trial of feeding cattle with and without salt it was found that there was practically no difference in the effects. The same result was noted with sheep. It is the usual practice in the locality, which is six miles from the seacoast, not to use salt in fattening cattle or sheep, either indoors or on pasture.

Experiments were made to determine whether it was possible to feed pigs profitably on meals alone. Maize and gram, an Indian pea, were the meals

tested. The gains were satisfactory, although the amounts of meals fed were smaller than the usual practice in the locality. A larger proportion of the gram was needed in the earlier periods of feeding.

Emergency cow feeds, H. K. GAYLE (*Mississippi Sta. Bul. 181* (*1917*), *pp. 6*).—Experiments in utilizing various waste forages for wintering cattle are reported. The forages were fed to breeding beef cows, divided into six lots of four cows each, with 1 lb. of cottonseed meal additional per head per day. The feeding lasted 28 days.

Pasture grass hay made up of native grasses, mostly overripe, was fed at a cost of $2.60 per ton. The cows consumed, besides the cottonseed meal, an average of 28.53 lbs. of the hay per head daily and gained 17.65 lbs. each in weight during the feeding period. The cost of the ration was 5.7 cts. daily. On a ration including oat straw, valued at $5 per ton, the cows gained an average of 52.1 lbs. each for the period. They consumed 24.8 lbs of straw daily and the entire ration cost 8.2 cts. daily. On forage cut from the corn fields, made up of cornstalks, grasses, and weeds put in the stack at a cost of $1.32 per ton, the animals used an average of 38.06 lbs. daily at a ration cost of 4.5 cts. daily. They lost 32 lbs. each during the period.

Cotton stalks from a field practically destroyed by the boll weevil were cut before the leaves had fallen and stacked at a cost of $2.30 per ton. The animals cleaned up an average of 27.48 lbs. per day and lost during the period 10.75 lbs. each. The cost of the ration was 5.2 cts. per day.

Silage was made from cotton heavy with leaf that was cut from a field severely damaged by boll weevil. It yielded at the rate of 4.5 tons of silage per acre and at an expense of $2.70 per ton. The animals consumed a daily ration of 38.68 lbs. and gained 38.7 lbs. for the period. The cost of the ration was 8.9 cts. daily.

Another field of cotton ruined by the boll weevil was cut and put in the silo in alternate loads with sorghum. The mixture was by weight ⅓ cotton and ⅔ sorghum, and was worth $2.90 per ton. The animals consumed an average of 49.9 lbs. of the silage per head daily and gained 13 lbs. each for the period, at a ration cost of 9.2 cts. daily.

A statistical study of body weights, gains, and measurements of steers during the fattening period, B. O. SEVERSON and P. GERLAUGH (*U. S. Dept. Agr., Jour. Agr. Research, 11* (*1917*), *No. 8, pp. 383–394, pls. 2*).—It is the purpose of this paper to establish some relation between body measurements of beef cattle and the gains in weight during fattening which might possibly prove a more scientific method of judging cattle than certain formula and rules now followed. The animals under observation were those fed in various experiments during three winters at the Pennsylvania Experiment Station.

As the process of fattening is the deposition of fat and muscular growth, the regions of the body most heavily covered naturally show the greatest development; also, the most valuable parts of the animal from a beef standpoint are most affected in the fattening process.

The usual measure of gain in steers is the increase in live weight. From the correlation of 338 steers fed at the Pennsylvania Station there was no relation in the daily gain which might be expected in weights of animals of close relation as to age and condition.

From the trials made it appears that the circumference of chest and rear flank, the width of hip joints, and the distance from hip to buttock indicate the closest relationship between measurements and gains in weight. The circumference of chest and rear flank are of more importance in indicating gains than feeding capacity as indicated by the circumference of the paunch.

Wool growing in Australia, R. W. HARROWELL (*Nat. Wool Grower, 7* (*1917*), *No. 10, pp. 11–13*).—Sales to the British Government were made the last season of 323,748,376 lbs. greasy wool and 34,310,645 lbs. scoured wool. The average price of greasy wool was 29.5 cts. per pound, or on a clean cost basis of 31 cts. The most serious drawback to sheep raising during the year was the blow fly, causing losses estimated at £378,000. To avoid losses from drought, larger storage of hay, fodder, and silage is being practiced.

The economical feeding of pigs, G. TURNBULL (*Jour. Brit. Dairy Farmers' Assoc., 31* (*1917*), *pp. 130–136*).—A résumé of results from various experiments.

War rations for hogs (*Wallaces' Farmer, 42* (*1917*), *No. 42, pp. 1415, 1420, figs. 2*).—At a farmers' meeting held at Ames, Iowa, the results of various experiments with new and by-product feeds were announced. The various feeds were fed to over 100 hogs. Among the unusual feeds were corn oil cake meal and garbage.

When three self-feeders were used, the first containing shelled corn, the second meat meal or tankage, and the third corn oil cake, the average daily gains on timonthy pasture were 1.38 lbs. per head, as compared with 1.11 lbs. on a typical shelled corn, meat meal, or tankage ration, self-fed. With garbage before them at all times, the hogs gained about 1 lb. a day. With hogs at $15, the daily value of the garbage from 100 persons is estimated at about 86 cts.

Pushing pigs on alfalfa pasture, J. M. EVVARD and R. DUNN (*Ill. Agr., 21* (*1917*), *No. 7, pp. 474, 475, 507*).—To test the value of alfalfa pasture for pigs, six lots about 2½ months old and weighing approximately 55 lbs. each were fed until they averaged 225 lbs. The first five lots were pastured on alfalfa and were fed in addition as follows: Lot 1, one-half ration of shelled corn and meat meal tankage twice daily; lot 2, three-quarter ration of shelled corn and meat meal tankage twice daily; lot 3, shelled corn to the limit of appetite and meat meal tankage twice daily; lot 4, same as lot 3 but fed three times daily; and lot 5, shelled corn self-fed and meat meal tankage self-fed. Lot 6 was kept in a dry lot and given shelled corn self-fed.

The best returns were produced by lot 5, which made faster gains on the smallest amount of both corn and tankage, requiring 3.74 lbs. of concentrated feed per pound of gain. Lot 4 came next, with a requirement of 3.89 lbs. feed per pound of gain, followed by lots 2 and 3.

The value of the alfalfa pasture in comparison with that of the concentrated feed saved was $30 per acre, and with one crop of hay cut the same season, the total value was $42 for the year.

The value of potatoes in swine feeding, F. G. ASHBROOK (*Proc. Potato Assoc. Amer., 3* (*1916*), *pp. 79–83*).—A general discussion of the subject, with data from various experiments.

Studies on the physiology of reproduction in the domestic fowl.—XVII, The influence of age upon reproductive ability, with a description of a new reproductive index, R. PEARL (*Genetics, 2* (*1917*), *No. 5, pp. 417–432, figs. 3*).—Statistical evidence accumulated in nine years' work at the Maine Experiment Station regarding the influence of age upon reproductive capacity in Barred Plymouth Rock fowls is presented. As a result of this study, which involved 1,114 matings, an index is proposed for the measurement of the net reproductive ability of matings of the fowl. This index expresses the actual number of chicks produced by the mating and capable of living three weeks after hatching as a percentage of the maximum total number of chicks which it would be physiologically possible for the mating to produce during the time which it endures, or one living chick three weeks of age per hen for each day during which the mating existed.

"For the strain of Barred Rocks used, and under the conditions of environment and management which obtained during the experiments, the reproductive index has a mean value of about 12 per cent. Net fertility, as measured by the reproductive index, is a rather highly variable character, agreeing in this respect with other purely physiological characters. Reproductive ability, as measured by the index, diminishes with advancing age of the birds mated, having its maximum when each of the birds mated is from 10 to 14 months of age. The decline in reproductive ability with advancing age is at a more rapid rate in the case of the males than in the case of the females. The results above stated are to be understood as being limited, for the present, to the breed, strain, and circumstances which furnished the data. How wide their generality may be is a matter yet to be investigated."

Standard varieties of chickens.—II, The Mediterranean and Continental classes, R. R. Slocum (*U. S. Dept. Agr., Farmers' Bul. 898 (1917), pp. 25, figs. 22*).—This continues work previously noted (E. S. R., 37, p. 368).

In addition to notes on the importance of egg production in the United States and the characteristics of the egg breeds, a general statement is made of the appearance and characteristics of the different varieties of Leghorn, Minorca, Spanish, Blue Andalusian, and Ancona breeds of the Mediterranean class and the Campine breed of the Continental class of fowls. Suggestions for breeding Brown Leghorns for exhibition purposes and notes on the inheritance of color in the Andalusian fowl are given.

[Poultry investigations], W. F. Schoppe (*Montana Sta. Rpt. 1916, pp. 179–181*).—Animal food (skim milk, green cut bone, commercial meat scrap, and fish scrap) showed a marked increase in egg production. For the entire year the best results were obtained with skim milk. During the winter months green cut bone proved greatly superior, but owing to its decomposing its general use is not recommended during warm weather.

In fattening poultry satisfactory gains in weight were made and improvement in quality. Ground barley fed in a mixture of other grains made a desirable feed for poultry. Gains of 15 to 30 per cent were made with chickens fed in crates for 17 days. Buttermilk and skim milk were superior to water in mixing mash. Conditioning poultry before marketing will pay in increased weight, while the improvement in quality should bring an extra price.

Owing to the cool nights prevailing in Montana it takes longer to mature chicks and they should be hatched early in the spring, March or April. Pullets should be well matured to start laying before cold weather sets in. From data collected on egg production it appears that a hen makes her best yields during the first laying year. However, with 24 Leghorn hens at the station more eggs were produced during the second and third years, and nearly as many during the fourth, as in the first year.

The present cost of egg production, H. R. Lewis (*New Jersey Stas. Hints to Poultrymen, 6 (1917), No. 2, pp. 5*).—Data are reported showing that for ten months from November, 1915, to August, 1916, the average price of brown eggs on the New York wholesale market was 31 cts. per dozen, while for the same period in 1916–17 it was 41.69 cts. The average price of white eggs during the same period increased from 34 cts. to 44.81 cts. In the same time dry mash increased 53.66 per cent and grain rations 74.6 per cent. It is shown in tables, however, that with the increased price of eggs and costs of feed the profits per bird were higher in 1916–17 than in 1915–16.

To further increase profits it is urged that the average egg production per hen be increased by selection and breeding.

Back-yard poultry keeping, R. R. Slocum (*U. S. Dept. Agr., Farmers' Bul. 889* (*1917*), *pp. 22, figs. 13*).—Attention is called to the value of a small flock of hens kept in the back yard as a means of reducing the cost of living of the family and enhancing the aggregate of food produced. Egg production rather than breeding poultry and the utilization of waste foods from the household are the main points brought out. The following suggestions are given: The size of the flock should be at least ten well-matured pullets rather than hens; scraps from the table and some green feed grown in the yard should make up most of the feed; no male should be kept as egg production throughout the season should be sought; and in the fall when the hens stop laying and begin to molt they should be killed for the table. Other useful suggestions as to housing and management are incorporated.

DAIRY FARMING—DAIRYING.

The rôle of water in a dairy cow's ration, C. Larsen, E. H. Hungerford, and D. E. Bailey (*South Dakota Sta. Bul. 175* (*1917*), *pp. 649–692*).—This investigation was conducted for the purpose of ascertaining the effects of watering the cow at different intervals and in varying amounts upon the amount of food consumed, digestibility of nutrients, amount and composition of feces and urine, amount and composition of milk, composition and quality of milk fat, body temperature, and physical condition of the cows. The bulletin also furnishes some data on the mineral metabolism of the cow.

Four cows were used during the first part of the experiment, January 2 to September 20, 1914, and three different cows during the second part, November 16, 1915, to January 26, 1916. There were three experimental periods of 30 days each, preceded in each case by a preliminary period of 30 days. During the first two preliminary periods the cows were watered every 8 hours, and during the third preliminary period they were watered every 12 hours. During the first experimental period the cows were watered once in 24 hours. During the second experimental period one cow was watered once in 12 hours and the other three cows once in 60 hours. In the third experimental period one cow was given a full allowance of water once in 24 hours and the other two cows one-half an allowance once in 24 hours. The rations consisted of 8 lbs. of a grain mixture of oats, bran, and linseed meal (3 : 3 : 1), 25 lbs. of corn silage, 1 oz. of salt, and all the hay they would eat. The amount of feed and water consumed, milk produced, and urine and feces voided was recorded, and samples of each were analyzed at stated intervals. The changes in milk fat constants during the experimental periods were also determined.

During the first 60-day period the four cows together consumed daily about 7 lbs. of hay less, 2 lbs. of silage less, and 9 lbs. of water less when they were watered but once each day than when they were watered once each 8 hours. There was also a slight decrease in milk, amounting to nearly 2 lbs. per day. The cows lost an average of 11 lbs. each during the first experimental period, while during the preliminary period they gained 18 lbs. each. When the cows received water once in 60 hours they lost 17 lbs. in weight in 30 days. When they received only one-half the normal amount of water every 24 hours they lost an average of 95 lbs. each in 30 days. In the periods when the cows received a full quota of water at long intervals there was not a very decided decrease in milk production. When they received only one-half the normal amount of water every 24 hours the milk flow decreased from an average of 18.26 to 14.06 lbs. daily. There was also a noticeable decrease in the amount of hay consumed.

The coefficient of digestibility was found to increase in each of the experiments where the interval between watering was lengthened, and also in the period where the cows received only one-half their normal water requirement. This increase was most noticeable for crude fiber, the digestibility of which was apparently increased from 55.7 to 71 per cent when water was withheld for 60 hours. The amount of crude fiber digested was also greater during the experimental periods than during the preliminary periods. The increase in digestibility of nitrogen-free extract and protein due to withholding water was not regular or marked.

The frequency of watering did not appear to have any appreciable effect on the composition of the feces, except that watering less frequently slightly reduced the crude fiber. When the cows received only one-half their normal water requirement there was an increase in the percentage of protein and nitrogen-free extract and also in crude fiber of the feces. The amount of feces voided bore a close relation to the amount of feed eaten. From this work it appears that the amount of dry rough feed consumed by the cow is closely related to the amount of water drunk.

No variation in the composition of the milk or milk fat was found that could be ascribed to lack of water. Analyses were made of the ash of the milk in the last two experiments. The results were normal.

When the cows were watered not less than once in 24 hours the body temperature was lowered only a fraction of a degree Fahrenheit, and this change in temperature occurred within 15 minutes after drinking the water. When the cows were watered once in 60 hours the body temperature was reduced 2° within 1.5 hours after watering. When the cows received only one-half the normal amount of water once in 24 hours the average body temperature was about 1° higher than when they received the full amount of water.

In order to ascertain more definitely the effect of a high body temperature of healthy cows on the percentage of fat in milk secreted, a series of experiments was conducted. Four grade cows were placed in a room, the temperature of which was made to vary from 51 to 104°. In each trial the cows were given water tempered to the same degree of heat as that of the room. When it was desired to increase the body temperature the cows were also blanketed. At a room temperature of 69° and body temperature of 101.2°, the average percentage of fat was 4.4. When the average room temperature was 104° and the body temperature 104.8° the average percentage of fat was 5.04. The amount of fat, however, was not increased in the same ratio.

The abnormal physical characteristics due to lack of water were nervousness, a gaunt appearance, and high body temperature. A larger amount of energy was required per 1,000 lbs. live weight to accomplish the body functions when the water was given once in 60 hours and when only one-half amount of water was supplied the cows.

The chief uses of water by the dairy cow are summarized. Tabulated data obtained in these experiments indicate that 12 per cent of the water drunk in winter and 27 per cent in summer is eliminated through the skin, about 56 per cent of the water is eliminated in the feces and 13 per cent in the urine, and about 15 per cent of the water ingested is used for milk production. One of the cows, a heavy milker, used about 24 per cent of the water for milk production.

Tabulated data are appended, showing the average daily rations and water consumed and the food-nutrient balances for each cow in the experiment.

Tests of three protein concentrates and two leguminous roughages in milk production, O. F. Hunziker and R. E. Caldwell (*Indiana Sta. Bul. 203 (1917), pp. 3–20, figs. 8*).—This experiment was conducted for the purpose of compar-

ing cottonseed meal, linseed meal, and gluten feed and alfalfa hay and soy-bean hay for milk production. Three lots of 5 cows each were fed for 180 days, the feeds being changed at the end of each 30-day period. During the test each lot received in addition to ground corn and corn silage (1) cottonseed meal and alfalfa hay, (2) cottonseed meal and soy-bean hay, (3) linseed meal and alfalfa hay, (4) linseed meal and soy-bean hay, (5) gluten feed and alfalfa hay, and (6) gluten feed and soy-bean hay. Analyses are given of the feeds used in the experiment.

The cows consumed approximately 1 lb. of grain and 1 lb. of hay per 100 lbs. of body weight. A larger amount of alfalfa hay was consumed than of soy-bean hay. The grain mixture was compounded according to a standard that would insure a uniform nutritive ratio for all the rations tested. The corn and cottonseed meal were mixed in the proportion of 16:1 when fed with alfalfa hay, and 10:1 when fed with soy-bean hay. Corn and linseed meal were mixed in the proportion of 14:1 when fed with alfalfa hay, and 7:1 when fed with soy-bean hay. When fed with alfalfa hay corn and gluten feed were mixed in the proportion of 8:1, and with soy-bean hay, 4:1. The daily dry matter consumption per cow varied from 20.82 to 22.9 lbs. and the protein consumption from 2.52 to 2.7 lbs. for all the rations. After the first 30-day period, during which the cows gained an average of slightly over 1 lb. each daily, they uniformly gained about ⅓ lb. on soy-bean hay and lost about an equal amount on alfalfa hay. However, the nutritive ratios of the rations containing alfalfa hay averaged 1:7.81, and of those containing soy-bean hay, 1:6.92.

The cows averaged 19.64 lbs. of milk and 0.9 lb. of fat per day on the alfalfa hay rations, and 18.41 lbs. of milk and 0.86 lb. of fat on the soy-bean hay rations. The feed cost of producing 100 lbs. of milk averaged 99 cts. on the alfalfa hay rations, and $1.07 on the soy-bean hay rations. There was only a very slight variation in the feed cost of milk due to the type of protein-carrying concentrates used. At $15 per ton alfalfa hay returned 10 cts. more per dollar invested than soy-bean hay. The data brought out in the experiments are illustrated graphically.

Nutrients returned by dairy cows.—Stage of lactation and individuality affect cost of milk production, R. I. Grady (*Mo. Bul. Ohio Sta., 2 (1917), No. 11, pp. 365–369, fig. 1*).—Data obtained from 36 herds consisting of 720 cows in various parts of the State indicate that, of the feed consumed by these cows from November to April, 7.71 per cent of the total digestible nutrients was suitable for human food.

During the first month of their lactation period 157 Jerseys returned as milk solids 22.2 per cent of the digestible nutrients consumed, and during the tenth month 7.3 per cent. Similarly, 131 Holsteins during the first month of their lactation period returned 19.2 per cent, and during the tenth month only 6.8 per cent of the digestible nutrients consumed. During the 10 months of the lactation period the Jerseys made an average return of 15.8 per cent, and the Holsteins 14.9 per cent.

The best Jerseys required 3.3 lbs. and the best Holsteins 3.9 lbs. of digestible nutrients for each pound of total solids produced. The poorest Jerseys required 9.4 lbs. and the poorest Holsteins 11.8 lbs. of digestible nutrients for each pound of solids produced.

Breeds of dairy cattle, H. P. Davis (*U. S. Dept. Agr., Farmers' Bul. 893 (1917), pp. 34, figs. 19*).—This outlines the factors to be considered in the selection of a dairy breed, and discusses the origin and characteristics of the Ayrshire, Brown Swiss, Guernsey, Holstein-Friesian, and Jersey breeds. The official score card for cows adopted by each of the breed associations and the

production record of the 10 highest producers of milk and milk fat, the more prominent families, and the performance records of a number of leading bulls of each breed are also given. The average production for cows that have completed yearly records for advanced registry is shown in the following table:

Average production of cows completing yearly records for advanced registry.

Breed.	Number of cows.	Milk production.	Fat content.	Fat production.
		Pounds.	*Per cent.*	*Pounds.*
Ayrshire	2,598	9,555.00	3.950	377.51
Brown Swiss	199	10,868.70	3.995	433.45
Guernsey	6,200	8,934.44	4.990	466.01
Holstein	3,220	14,622.70	3.424	500.70
Jersey	5,244	7,792.00	5.350	417.00

[Milk preserved with formalin for calves], H. WELCH (*Montana Sta. Rpt. 1916, p. 182*).—Seven calves from one to two weeks old were fed skim milk to which enough formalin had been added to keep it sweet for four to six days at temperatures averaging 80° F. As a check, seven calves were fed on untreated skim milk. During the six weeks of the test the two lots gained equally in weight, and the calves on formalin-preserved milk were in every way as thrifty and healthy as the other lot.

The milking machine as a factor in the production of sanitary milk, G. L. A. RUEHLE, R. S. BREED, and G. A. SMITH (*Amer. Jour. Pub. Health, 7 (1917), No. 10, pp. 840–846*).—Results of bacteriological analyses seem to show that the machines on the market can be successfully used to produce more sanitary milk than that obtained by hand milking.

Relationship of milk supplies to typhoid fever, W. H. FROST (*Pub. Health Rpts. [U. S.], 31 (1916), No. 48, pp. 3291–3302; abs. in Abs. Bact., 1 (1917), No. 5, pp. 410, 411*).—This paper calls attention to the deficiency of our knowledge of the relationship between milk supplies and the prevalence of typhoid fever. The author suggests that the influence of a milk supply in disseminating typhoid fever is determined by (1) the sources of infection to which the milk is exposed, (2) the opportunities afforded for infective material to be introduced into the milk from these sources or the precautions taken to safeguard against the introduction of infective material, and (3) circumstances affecting the potentiality of the milk supply in disseminating infection after infective material has once been introduced. Opportunities for estimating the influence of milk supplies upon typhoid prevalence are pointed out.

Some observations on the bacterial examination of milk, F. H. SLACK (*Amer. Jour. Pub. Health, 7 (1917), No. 8, pp. 690–697; abs. in Abs. Bact., 1 (1917), No. 5, p. 411*).—The author concludes that incubation of milk plates for 48 hours rather than 24 hours is advisable, since, on an average, the count is doubled or trebled. The use of meat extract media for milk counts should be abandoned, since it gives lower counts and the colonies are much smaller than with media made from fresh beef juice. A preliminary microscopic estimate of the number of bacteria in a milk sample by the smeared sediment method is advisable, (1) to rule out specimens of low bacterial content on which no further work need be done, and (2) to judge the proper dilution for specimens which must be plated.

A safe and sane milk supply, J. WEINZIRL (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 10, pp. 127–130*).—It is stated that pasteurized milk, when the process has been properly carried out, is safe so far as disease is concerned.

Certified milk is also satisfactory in this respect. A sane milk supply, however, must also be free from excessive dirt. To eliminate dirt the milk should be rated on the basis of laboratory tests, such as (1) total count, (2) *Bacillus coli* determination, (3) visible dirt test, and (4) *B. sporogenes* determination. It should be graded according to the laboratory tests into A, B, and C grades, and these stated upon the bottles and containers in which the milk is sold.

A sane milk supply must also be cheap enough to be within reach of the common people. For this purpose certified milk is a failure. If dairy demonstration supersedes dairy inspection and laboratory tests the score card in grading milk, and care is made superior to equipment in barns and machinery, then it is maintained that a clean milk may be had at a reasonable price as well.

Milk and its distribution in Philadelphia, T. B. Harbison (*Philadelphia: Chamber Com., Ed. Committee, 1917, pp. 12, figs. 12*).—This number of the series of educational pamphlets issued by the Philadelphia Chamber of Commerce explains the methods of handling and safeguarding the milk supply of Philadelphia.

Dairying in Colorado, R. McCann (*Denver, Colo.: Colo. Bd. Immigr. [1917], pp. 10, figs. 2*).—The development and future prospects of the dairy industry in Colorado are outlined.

VETERINARY MEDICINE.

Immune sera, C. F. Bolduan and J. Koopman (*New York: John Wiley & Sons, Inc., 1917, 5. ed., rev., pp. VIII+206, figs. 9*).—This is the fifth edition of the work previously noted (E. S. R., 26, p. 579). Neither the plan nor scope of the previous edition has been changed, but the entire material has been revised.

Dichloramin T and chlorinated eucalyptol 1.2, 2, R. B. Krauss and E. Crede (*Jour. Amer. Chem. Soc., 39 (1917), No. 12, pp. 2720–2722*).—The authors describe a method for the preparation of stable toluene-*p*-sulphon-dichloramid (dichloramin T), a method for the preparation of chlorinated eucalyptol (specific gravity 1.2), and other chlorination products of eucalyptol on a large scale.

Preparation of a preservative from cresol, Mary Nevin and B. Mann (*Jour. Amer. Chem. Soc., 39 (1917), No. 12, pp. 2752–2756*).—Experimental data presented show that purified and redistilled cresol can be used as a preservative for biological products. The fraction boiling between 199 and 204° C. (specific gravity 1.03 at 25°) was best for this purpose. Its toxicity was found to be the same as phenol, slightly lower than that of "Trikresol," but having a germicidal coefficient of 2.55, which is higher than that of Trikresol.

It is indicated that investigations are being carried out to determine the practical value of preservatives in immune sera and purified antitoxin.

The toxin of Bacillus welchii (*Jour. Infect. Diseases, 21 (1917), No. 6, pp. 580–599*).—The two following papers are presented:

I. *Toxin production by various strains*, P. H. DeKruif, T. W. Adams, and P. M. Ireland.—The authors have studied the toxicogenic power of ten strains of *B. welchii*, and have found that all produce toxin in a greater or less degree. An antitoxin produced by the injection of toxin from a single strain neutralized all of the other toxins, a fact which indicates the common nature of the toxic products of the various strains. In studying various methods of toxin production, it was found that the usual layer of sterile paraffin oil was not necessary for securing growth or toxin production, and that methods of removing oxygen, such as exhaustion or absorption, were superfluous. Boiling the medium before use was found to be sufficient. A considerable concentration

of toxin was secured by the use of a veal broth medium instead of sterile rabbit muscle. Finely chopped veal was added to a 0.1 per cent glucose, +0.5 reaction, and autoclaved at 110° C. for 30 minutes. By the use of this medium the complication of technique was considerably reduced and a toxin concentration obtained as great as by any other procedure.

II. *The mechanism of infection with B. welchii*, P. H. DeKruif and J. L. Bollman.—The results of the study reported showed that "bacilli removed from broth cultures by centrifugation and subsequently washed with large volumes of 0.85 per cent NaCl are far less infectious than equal numbers of organisms not separated from the medium in which they have grown. The virulence of washed organisms is increased at least 10,000-fold by the simultaneous injection of nonlethal amounts of neutralized culture filtrate. This aggressive activity of the culture filtrate is destroyed by heating to 70° for 30 minutes, and by the addition of the specific Welch antitoxin."

From these results it is concluded that the aggressin of the filtrate and the toxin are identical. "This conclusion is strengthened by the fact that sublethal amounts of toxin made by the muscle culture method show a similar aggressive effect, which is likewise neutralized by the addition of antitoxin. Nonspecific culture filtrates from cholera and proteus cultures do not increase the virulence of washed bacilli. The aggressive substance (toxin) seems to act by reason of its necrotic effect and not by a negative chemotactic influence on leucocytes."

The prophylactic and therapeutic properties of the antitoxin for Bacillus welchii, C. G. Bull (*Jour. Expt. Med., 26 (1917), No. 4, pp. 603–611*).—"It has been possible to confer on guinea pigs a passive immunity of about two weeks' duration to *B. welchii* toxin through a protective administration of the antitoxin. Guinea pigs which had received a prophylactic dose of *B. welchii* antitoxin exhibited pronounced resistance to infection with the virulent bacilli for a period of 12 days. Established infections in guinea pigs with *B. welchii* have been arrested and controlled by treatment with the antitoxin."

Possibilities of the prevention of *B. welchii* infection in man through the prophylactic use of the antitoxin and the control of developed cases of the infection by therapeutic injections of the antitoxin are noted.

The colon-ærogenes group from silage, O. W. Hunter (*Jour. Bact., 2 (1917), No. 6, pp. 635–639*).—A study of 95 coli-like cultures isolated from different kinds of silage (alfalfa, Kafir corn, and corn) and 15 from the growing fields of alfalfa and Kafir corn, made by the author at the Kansas Experiment Station, showed 48.18 per cent of the organisms to be *Bacillus lactis ærogenes*, 30.9 per cent *B. coli communior*, 10.9 per cent *B. coli communis*, and 10 per cent *B. lactis acidi.*

"Classified according to origin, as differentiated by methyl red, 79.08 per cent were nonfecal strains, while 20.9 per cent were of fecal origin. All the strains represented by the *B. coli communis* and *B. lactis acidi* groups were fecal types, while the organisms included in the groups represented by *B. coli communior* and *B. lactis ærogenes* were nonfecal strains. A correlation between the Voges-Proskauer reaction and the hydrogen-ion concentration was observed in all cultures. Litmus milk was coagulated by 90.9 per cent of all fecal strains, while 98.5 per cent of the nonfecal types exhibited only an acid reaction."

Properties of the serum of animals hyperimmunized against glanders and the choice of animals for the preparation of a serum rich in glanders antibodies, E. Bertetti and G. Finzi (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 26 (1917), II, No. 5, pp. 131–135*).—From the work reported the authors conclude that it is possible to obtain from various animals (ox,

horse, mule, and ass) an antiserum which possesses strong precipitating powers for various glanders sera and filtrates of cultures of glanders bacilli, the precipitating substance being specific. The existence of a greater or less individual variation to glanders infection influences the production of antibodies in an inverse proportion. The production decreases progressively in the following order: Horse, mule, ass.

An animal should not be treated with the virus from the broth or agar culture, since the products appear to be neutralized in vivo by the antibodies. The soluble products from a suspension of *Bacillus mallei* should be used for the inoculation.

The precipitin contained in the antiglanders serum produced was found to be thermolabile, being destroyed by heating to from 55 to 60° C.

Channels of infection and localization in tuberculosis, C. H. Higgins (*Jour. Amer. Vet. Med. Assoc., 52 (1917), No. 3, pp. 299–308*).—From experimental data and cases reported it appears that under certain conditions tuberculosis may be merely a localized infection and the infection thus pass unnoticed even after a careful post-mortem examination. "It is quite apparent that the channel of infection governs to a large degree the localization of the lesions, and that infections observed in glands through which the lymph of an extremity or locality drains is a direct intimation that the infection has taken place in some locality from which the particular gland in question takes up its lymph supply."

It is noted that greater care should be taken in performing autopsies, and that more accurate records should be kept by all observers.

Tuberculin test and retest, C. J. Marshall and H. W. Turner (*Jour. Amer. Vet. Med. Assoc., 52 (1917), No. 3, pp. 308–337*).—Data presented show that the best results were obtained when the retest was made about seven days after the original subcutaneous test and in conjunction with the ophthalmic test. Tuberculous animals were found to remain sensitive to tuberculin for a certain length of time after the original injection, the period, however, not being the same in all animals. The original injection of tuberculin is considered to sensitize the cells and make them more receptive to the retest tuberculin.

The authors recommend that in "herds in which there is no history of a previous tuberculin test, the ordinary subcutaneous test should be used on all animals over six months of age. Where 10 per cent or more of them react, a retest should be made with retest and ophthalmic tuberculin in from four to seven days. The semiannual subcutaneous testing of herds should not be continued, as too frequent tests lessen the sensibility of the animals to tuberculin and the reliability of the test to the owner. When a semiannual test is required the ophthalmic test only should be used. In animals under six months of age, the intradermal test should be used and where possible it should be combined with the ophthalmic or intrapalpebral test."

Making cattle environs free from infection eliminated by tuberculous cattle, J. Traum (*Jour. Amer. Vet. Med. Assoc., 52 (1917), No. 3, pp. 289–299*).—Results of experiments by the author, at the California Experiment Station, to determine the resistance of tubercle bacilli deposited on soil, the resistance when underground, and the resistance in water holes are reported.

The data obtained show that tubercle bacilli in feces and lung discharges can no longer produce tuberculosis in guinea pigs by inoculation when exposed in the dry season after three months, depending to a great extent, however, upon how soon the medium in which the bacilli are found is freed from moisture. The tubercle bacilli were found to remain alive in water for at least six months.

The effect of disinfectants upon the tubercle bacilli is briefly discussed, and some experimental results upon the specific effect of hypochlorite solutions on

the organisms reported. All the animals inoculated with the medium containing the organisms which had been treated with hypochlorite solutions developed tuberculosis. It is indicated that the evidence submitted, however, should be considered tentative until substantiated by further work.

Report of the committee on veterinary inspections and protection against tuberculosis of the American Association of Medical Milk Commissions, 1916–17, E. C. FLEISCHNER (*Jour. Amer. Vet. Med. Assoc., 52 (1917), No. 3, pp. 268–288*).—This report presents the results obtained from a questionnaire sent out by the committee to the secretaries of all the milk commissions in an endeavor to determine the conditions and activities of these commissions. Satisfactory replies were received from 32 (about 41 per cent) of the commissions. From 16 of the commissions replies were received which showed that the work carried on was either definitely unsatisfactory or that the function of the commission had ceased to be of value to the community.

The questionnaire and general results obtained are submitted and discussed in some detail, together with recommendations of the committee to the association.

Chronic arthritis in swine, S. SEKIGUCHI and E. E. IRONS (*Jour. Infect. Diseases, 21 (1917), No. 6, pp. 526–540, pls. 2*).—Of 21 cases examined hemolytic streptococci were found in 2, bacilli in 9, streptococci and bacilli in 4, no organisms in smears, sections, and cultures in 4, and in 2 cases bacteria were found in either smears or sections, which, however, failed to grow in cultures. Comparatively slight pathological changes were observed in most of the cases which did not yield any organisms at all or not in cultures. Pathological changes in the others are described.

A study of the bacilli isolated from the joints in some of the cases showed them to be culturally alike, and in morphology and most cultural reactions to resemble *Bacillus pyogenes* as described by Dutch and German veterinarians who isolated the organisms from cattle and swine. The bacilli obtained by the authors, however, did not liquefy gelatin and Loeffler's serum. "While the bacillary infection is apparently the etiologic agent in most of the cases included in this study, and the streptococcal infection apparently a later and secondary one . . . there may well be other organisms of suitable virulence which can set up similar processes. It seems important, however, to emphasize the element of nontuberculous infection in chronic deforming joint lesions in animals otherwise in good health."

Subcutaneous and intravenous inoculations of the bacilli produced lesions of the joints. "It is possible that puncture wounds of the skin in infected yards may be the means of initial infection in some instances. The alimentary tract can not be excluded, for in one case we found a marked chronic nontuberculous infection of the mesenteric lymph nodes associated with arthritis. . . . The occurrence of arthritis in some herds and not in others suggests local sources of infection on the affected farms. It would seem advisable to exclude from the hog lot any animals with chronic suppurations, whether swine, cattle, or other animals, for the same reasons that cattle and other animals suffering from tuberculosis are excluded to prevent tuberculosis among the hogs."

Cultural and inoculation studies of the streptococci isolated from the joint lesions were also made and are described.

Review of research work on hog cholera, M. DORSET (*Rpt. U. S. Live Stock Sanit. Assoc., 20 (1916), pp. 42–51*).—From experimental work on the transmission of hog cholera the following general results are noted:

Results were obtained from which the author concluded that hog cholera is contagious at all stages, including the stage of incubation. Data obtained from some preliminary work showed that not all recovered pigs are cholera

carriers. Only two observations were made in this work, however, and it is indicated that no very definite conclusions can be drawn.

Other results showed that putrefaction may destroy the cholera virus. It was also shown that the usually accepted statement that hog cholera is invariably transmitted by attendants is doubtful.

In determining the period of infectivity of premises, it was found that in no case did susceptible pigs contract the disease in infected pens 24 hours after the removal of sick pigs. In one case the disease was contracted when exposure took place 6½ hours after the removal of sick pigs. In the concrete, wooden, and sandy floored pens, pigs which were exposed 1 hour after the removal of sick pigs contracted the disease, while in the pens which had sandy loam and clay floors the pigs remained well.

In determining the infectivity of excretions of cholera-infected hogs infectious before symptoms appeared, it was found that the blood and urine were both infectious on the first day after the injection of the hog, the feces on the second day, and the eye and nose secretions on the third day. No visible symptoms of the disease were observed until the fifth day, although there was a slight increase in temperature on the fourth day. It thus appears that the blood, urine, feces, and eye and nose secretions of cholera hogs may all be infectious before the animal exhibits any symptoms of the disease.

Increased virulence of the hog-cholera bacillus produced by passage through rabbits, C. Tenbroeck (*Jour. Expt. Med., 26 (1917), No. 3, pp. 437–440*).—The author has increased the virulence of a culture of the hog-cholera bacillus 1,000 times by passage through a series of 11 rabbits. A subcutaneous injection of 20 organisms, or 0.00000001 cc. of a 24-hour bouillon culture, or a drop of bouillon culture rubbed into the shaven skin produced a characteristic disease in the rabbit resulting in death on or about the sixth day.

The organism used in the work was isolated several years ago from the spleen of a pig which died from hog cholera. After isolation the organism was passed through a rabbit and has since been kept on slant agar in the cold, transfers having been made monthly. It is a motile, Gram-negative rod, growing readily on the ordinary media and forming acid and gas in dextrose bouillon but not attacking lactose or saccharose. It was quantitatively agglutinated by serum from rabbits injected with other strains of the hog-cholera bacillus, and when injected into animals caused the production of agglutinins for other strains of the hog-cholera bacillus.

The significance of agglutinins in the immunity of the rabbit to the hog-cholera bacillus, C. Tenbroeck (*Jour. Expt. Med., 26 (1917), No. 3, pp. 441–451*).—The results of the work reported indicate that "rabbits may show a high agglutination titer to the hog-cholera bacillus and have no immunity and, on the other hand, immune animals may have a comparatively low agglutination titer." With the organism used it is considered that the height of the agglutination titer does not indicate the degree of immunity.

Because of the similarity, biologically and pathologically, between the organism used in the work reported and the typhoid bacillus it is concluded that the degree of agglutination titer in man does not indicate the actual degree of immunity to the typhoid organism. The necessity of testing other organisms before a more general conclusion can be drawn is noted. "This does not mean that agglutinins are not related to immunity but it brings up the question of the wisdom of using them as a guide in immunization with the colon-typhoid group. When injected into the normal, vaccinated, or immune rabbit, the virulent hog-cholera bacillus is rapidly clumped and disappears from the circulation. Forty minutes after injection these organisms can be found in phagocytes in the liver."

Studies in forage poisoning.—V, A preliminary report on an anaerobic bacillus of etiologic significance, R. GRAHAM, A. L. BRUECKNER, and R. L. PONTIUS (*Kentucky Sta. Bul. 207* (*1917*), *pp. 47–113, figs. 36; abs. in Jour. Amer. Vet. Med. Assoc., 51* (*1917*), *No. 6, pp. 748, 749; Amer. Jour. Vet. Med., 12* (*1917*), *No. 10, p. 702*).—In an introduction to this bulletin A. M. Peter, acting director, briefly refers to the occurrence of forage poisoning in Kentucky and the investigations of it which have been conducted by the Kentucky Station. The present bulletin, which reports investigations carried on in continuation of studies which have extended over a number of years (E. S. R., 37, p. 689), deals with the isolation of a pathogenic anaerobic bacillus from an oat hay and the efficacy of an antiserum, prepared against *Bacillus botulinus*, in protecting animals against a disease having the characteristics of forage poisoning.

In the first part of the bulletin the authors review the present status of information relating to botulism in man and discuss the analogy of botulism to forage poisoning, the pathogenesis of *B. botulinus*, and its food requirements.

The investigations reported have been summarized by the authors as follows: "An oat hay which had caused a sporadic outbreak of forage poisoning retained its virulence in storage for approximately 22 months. The etiologic factor in this forage proved to be water soluble and capable of causing symptoms of forage poisoning and death in horses after freely drinking the water from the oat hay.

"*B. botulinus* proved fatal to horses and mules, subsequently to ingestion in wholesome feed, as well as by subcutaneous injection. The clinical symptoms and anatomic alterations accompanying artificial *B. botulinus* infection in horses and mules closely resembled the symptoms and gross anatomic lesions recognized in natural outbreaks of forage poisoning in central Kentucky.

"Chickens proved highly resistant to *B. botulinus* administered subcutaneously and by the mouth. The naturally voided excreta of fowls that had been fed *B. botulinus* proved fatal to a mule after ingestion, involving the domestic chicken as a possible agent in contaminating feedstuffs, should *B. botulinus* be prevalent in nature. This observation confirms Van Ermengem's original classification of *B. botulinus* as a toxic saprophyte and is in keeping with our observations upon an oat hay which proved to be contaminated with chicken feces. It has been previously reported in another paper [E. S. R., 34, p. 681; 36, p. 580] that chicken excreta from the oat hay in question, disguised in wholesome feed of a horse, caused symptoms of forage poisoning and death.

"Antitoxic goat, sheep, and cow sera, prepared against *B. botulinus*, proved efficacious against lethal amounts of a homologous toxin. The antitoxic serum afforded protection in horses when administered subcutaneously and intravenously, and in guinea pigs when administered intraperitoneally, against a fatal amount of homologous toxin by the mouth.

"*B. botulinus* can be cultivated in corn silage, alfalfa, and corn extracts, made slightly alkaline. In similar forage decoctions, made slightly acid, as well as in pork broth, *B. botulinus* can be propagated in association with *Fusarium* sp., under aerobic conditions.

"An anaerobic organism resembling *B. botulinus*, isolated from the cecum of a horse fatally infected after drinking water in which the oat hay in question had been immersed, proved fatal to horses, mules, and guinea pigs, administered by the mouth. The clinical symptoms and anatomic changes in horses experimentally infected with this organism proved to be indistinguishable from symptoms and gross lesions observed in horses as a result of feed-

ing *B. botulinus.* This organism was recovered from a horse after death following a fatal artificial infection. Antitoxic serum prepared against *B. botulinus* apparently provided protection in guinea pigs, administered intraperitoneally, and in horses, administered intravenously, against infection by the mouth with a lethal amount of the organism isolated from the cecum of [the horse referred to above]. The sterile broth culture filtrate of the organism isolated from this horse proved fatal to horses after ingestion. Antitoxic serum prepared against *B. botulinus*, administered intravenously, apparently afforded protection against lethal amounts of this filtrate.

"An anaerobic organism resembling *B. botulinus*, isolated from water in which the oat hay had been immersed proved fatal to horses, mules, and guinea pigs, when administered by the mouth. *B. botulinus* antitoxic serum administered intravenously and subcutaneously to horses and mules and intraperitoneally to guinea pigs, apparently provided protection in these animals against a lethal infection, per os, of the organism isolated from the water in which the oat hay had been immersed. The sterile filtrate from a broth culture of the organism isolated from the oat hay proved fatal to horses, after ingestion, and botulism antitoxic serum, administered intravenously, proved efficacious in protecting horses against a lethal quantity of the filtrate, administered by the mouth.

"Several horses receiving prophylactic injections of *B. botulinus* antitoxic serum consumed water, for 30 days, from the barrel in which the oat hay was immersed without noticeable effect, at the end of which time a lethal amount of the organism isolated from the oat hay water was also consumed with impunity. In one horse antitoxic serum apparently did not afford protection against the oat hay water. For a period of 30 days three horses consumed the water in which the oat hay was immersed without noticeable effect, but succumbed after ingesting a lethal amount of the organism resembling *B. botulinus* isolated from the oat hay.

"The definite, morphological, cultural, and serological characters of the organism isolated from the experimental horse [previously mentioned] and of the organism isolated from the oat hay water closely ally them to *B. botulinus* and to our knowledge constitutes the first time this, or an allied anaerobic organism, has been definitely established as an etiologic factor in forage poisoning."

Studies in forage poisoning.—VI, An anaerobic organism isolated from silage of etiologic significance, R. Graham, A. L. Brueckner, and R. L. Pontius (*Kentucky Sta. Bul. 208* (*1917*), *pp. 117–133, figs.* 7).—This is a report of investigations of forage poisoning carried on in connection with those above noted. The present paper deals with studies made of an anaerobic organism isolated from corn silage during the course of an outbreak of forage poisoning in Carroll County, Ky., which resulted in the loss of a number of mules. The causative organism isolated from the silage was an anaerobic spore-bearing bacillus possessing morphological and cultural charcteristics resembling those of *Bacillus botulinus.*

"In preliminary tests the unfiltered broth culture of this organism, administered by the mouth, proved pathogenic for guinea pigs and a mule. The filtered broth culture, administered by the mouth, proved fatal to guinea pigs, two horses, and a mule. A protection was provided by administering botulism antitoxin to guinea pigs and horses against a lethal amount of the organism in broth or the sterile filtrate of broth culture of the organism in question. Serum immune to the bacillus isolated from the silage proved efficacious in protecting guinea pigs against a fatal artificial infection of *B. botulinus*, as well as against

the organism isolated from the silage. The agglutinins present in serum highly immune to *B. botulinus* were active to the organism isolated from the silage, thus contributing evidence of the possible relation of this organism to *B. botulinus*. Normal sera of different animals did not agglutinate *B. botulinus* nor the organism from the silage. Sheep serum immune to the organism isolated from the silage possessed agglutinating potency to *B. botulinus*, and to a similar pathogenic anaerobe isolated from a horse fatally afflicted subsequently to drinking water in which was immersed an oat hay obtained from a distant outbreak of this disease."

Repair of bone in the domestic fowl, B. F. Kaupp (*North Carolina Sta. Tech. Bul. 14 (1917), pp. 3–17, pls. 11*).—The author here considers the structure and development of the bones of fowls, the kinds of fractures and the reparative processes, and means of controlling the bird and care of the fracture. The studies consist of a series of 21 cases of fractures in the domestic fowl. "It was found that at the end of the fifth day islands of bone tissue had begun to form. The repair of fractures in the domestic fowl is intramembranous. The periosteal, endosteal, and intermediary calluses show bone formation in trabecular-like arrangement. By the end of the thirteenth day the major portion of the bone tissue had formed and was found completed before the twentieth day. The appliance used to hold the broken bones in apposition in the domestic fowl may be removed with safety by the end of the twelfth or thirteenth day. The structure of compact bone in the domestic fowl is similar to that of mammalia."

Life history of Ascaris lumbricoides and related forms, B. H. Ransom and W. D. Foster (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 8, pp. 395–398*).—The investigations of Stewart (E. S. R., 37, p. 374) having shown that the embryos from Ascaris eggs fed to rats and mice hatch out in the alimentary tract and migrate to the liver, spleen, and lungs, in the course of which they pass through certain developmental changes, and regain the alimentary tract by the way of the lungs, trachea, and esophagus, resulting in pneumonia in many of the infested animals, led the authors to conduct the experiments here reported. The results obtained and the deductions drawn therefrom are summarized as follows:

"The development of *A. lumbricoides* and closely related forms is direct, and no intermediate host is required. The eggs, when swallowed, hatch out in the alimentary tract; the embryos, however, do not at once settle down in the intestine, but migrate to various other organs, including the liver, spleen, and lungs. Within a week, in the case of the pig Ascaris, the migrating larvæ may be found in the lungs and have meanwhile undergone considerable development and growth. From the lungs the larvæ migrate up the trachea and into the esophagus by way of the pharynx, and this migration up the trachea may already become established in pigs, as well as in artificially infected rats and mice, as early as a week after infection. Upon reaching the alimentary tract a second time after their passage through the lungs, the larvæ, if in a suitable host, presumably settle down in the intestine and complete their development to maturity; if in an unsuitable host, such as rats and mice, they soon pass out of the body in the feces.

"Heavy invasions of the lungs by the larvæ of Ascaris produce a serious pneumonia which is frequently fatal in rats and mice and apparently caused the death of a young pig one week after it had been fed with numerous Ascaris eggs.

"It is not improbable that ascarids are frequently responsible for lung troubles in children, pigs, and other young animals. The fact that the larvæ

invade the lungs as well as other organs beyond the alimentary tract and can cause a serious or even fatal pneumonia indicates that these parasites are endowed with greater capacity for harm than has heretofore been supposed.

"Age is a highly important factor in determining susceptibility to infection with Ascaris, and susceptibility to infection greatly decreases as the host animal becomes older. This, of course, is in harmony with the well-known fact that it is particularly children and young pigs among which infestation with Ascaris is common, and that Ascaris is relatively of rare occurrence in adult human beings and in old hogs."

In a footnote the authors call attention to the fact that later experiments with guinea pigs have shown that they also may be infected by feeding Ascaris eggs, and that the migration of the larvæ in this animal so far as observed is identical with that noted by Stewart in rats and mice. All of six guinea pigs infected died from pneumonia seven and eight days after feeding with Ascaris eggs, the lungs being found heavily infested with Ascaris larvæ.

RURAL ENGINEERING.

The waters of the Rio Grande, W. P. Headden (*Colorado Sta. Bul. 230 (1917), pp. 3–62*).—This report states that the Rio Grande flows for about 60 miles through the San Luis Valley without any considerable change in the character of its waters, the flow diminishing rather than increasing. "There are only a few streams having a visible discharge into the Rio Grande. The drainage is practically out of the Rio Grande into the valley. . . .

"The ground waters of the valley retain the characters of the mountain waters in a noteworthy degree, and . . . have their own characteristics, which are pronounced enough to affect those of the Rio Grande water if any significant volume of them is mingled with it. The alkalis, that is, salts that collect in the surface portions of the soil or appear as efflorescences, are of three types. These types are (1) plain sulphates, soda and lime being the prodominant bases (this type is the predominant one); (2) sulphates and chlorids (this type is not abundant though it is well distributed); and (3) a type in which sulphates and carbonates occur (the occurrence of this type is for the most part confined to the area north of the Rio Grande). Solutions of these alkalis do not find their way into the Rio Grande in sufficient quantities to noticeably modify the composition of its water.

"The valley is an exceedingly large artesian basin, but the waters are of two characters. Those of the southern portion and the rim of the basin are white and carry an excess of acids. Silicic is especially high, while those of the northern interior portion of the basin are alkaline and usually brownish or brown in color. The white artesian waters, especially those flowing from shallow wells, from 75 to 300 ft. or even more, are very similar to river or mountain water and would simply increase the volume and would not change the character of the river water if they mingled with it.

"The brown water is free from silicic acid and contains as good as no salts except sodic carbonate. This character of the brown waters is the same for all flows from the shallowest to the deepest examined, 880 ft. The deeper flows increase in the amount of salts held in solution without any change in their character. This increase was from 22 to 108 grains in each imperial gallon. These waters would change the character of the river water if they mingled with it, which they appear not to do. The brown color is accidental and is due to peaty material dissolved out of the aquifers themselves. . . .

"The sodic carbonate is considered as originally coming from the mineral constituents of the rocks furnishing the sands and clays that form the strata

now composing the floor of the valley. The changes necessary to remove the silicic acid and lime from the mountain waters are simple. The small concretions of calcic carbonate met with in the sand from the strata passed through at 550 ft. indicate simple precipitation as the method of removing the lime. . . . Evaporation alone is considered adequate to account for the concentration of the sodic carbonate that we find in this section. Evaporation at the present time is sufficient to add 145,500,000 lbs. of sodic carbonate to this section of the valley yearly. This is on the supposition that the mountain water carries 2.5 grains of sodic carbonate in each imperial gallon, or 10 lbs. of water evaporated.

"The present agricultural condition of this section of the valley is due to the accumulation of this salt, black alkali, rather than to an excess of water. Local surface drainage is necessary in many small localities. The evaporation from the area involved is equivalent to an inflow of 2,000 sec.-ft. throughout the year. This is probably a larger amount than this section of the valley actually receives, except for a very short period in the spring of the year when the direct overland inflow may equal or possibly exceed this amount.

"The San Luis Lake water is peculiar in its composition and unlike either the river, ground, or artesian waters. The deposit of sodic carbonate east of the San Luis Lake is probably derived from the evaporation of the brown artesian water, and has no connection with the lake. The conditions which have determined the character of the brown artesian waters are still active in determining the agricultural features and questions of this section of the valley. The question of black alkali in this section is in places further involved by the occurrence of nitrates. The conditions which obtain and are inimical to vegetation can be ameliorated by rational irrigation, chemical treatment of the soil, and surface drainage where needed."

Run-off from the drained prairie lands of southern Louisiana, C. W. Okey (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 6, pp. 247–279, figs. 5*).—Investigations on the relations between the rainfall and the amount of water that it is necessary to pump from 10 typical drainage districts in order to secure a degree of drainage that will allow the growing of ordinary field crops are reported. The districts vary in area from 647 to 7,500 acres and the details of soil, crops, surface slope, and character of the drainage channels and levees are different on each district. A brief description of each district is given together with a brief summary of conditions prevailing during each year covered by the records. The results of the investigations are graphically reported.

"It is evident that the effect on the run-off of a change in the capacity of the pumping plant can not all be measured by the change of level of the water in the main reservoir channels, as greater slope and velocity of water occur in the drainage channels when a larger pumping plant is installed. This effect extends even to the small field ditches.

"In estimating the run-off likely to result from an assumed storm on a given district the curve used should be that for the district which resembles the given district in area, pumping-plant capacity, reservoir capacity, and general conditions. The curves may be considered only as representing general tendencies and not definite values. They should be of service, however, in making the proper adjustment between reservoir and pumping-plant capacity. . . . It is believed that, in general, after a capacity of about 0.5 in. of water over the area drained has been provided in the main reservoir channels between the surface and a level 5 ft. below it will be cheaper to obtain increased capacity to handle storms by enlarging the pumping plant rather than the reservoir.

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This will depend, however, on local costs for excavation and pumping machinery.

"In determining the proper combined capacity of the pumping plant and reservoir the main factor to be considered is the amount of rainfall in an assumed period for which provision is to be made. . . . As the accompanying curves were prepared with data from storms which occurred when the land was wet, a determination has been made of the proportion of storms which occur when the land is wet. Of all the storms of over 2 in. in 24 hours which have occurred on the districts during the time covered by the records, 64 per cent occurred on a wet and 36 per cent on a dry surface; of all storms over 4 in. the percentages are 54 per cent and 46 per cent, respectively. Of course, the storage capacity of the land influences the run-off from the small storms relatively much more than it does that from the large ones. However, an examination of the daily rainfall and pumping records will show that heavy rains on a dry soil do not make very heavy demand on the pumping plant. It is believed, therefore, that a reduction of about 30 per cent in the average frequency of storms could be made safely and that the resulting figure would be the proper one for use. If the character of operations that are to be conducted on the land of a given district is known, a decision can then be made as to the heaviest storm for which provision must be made. On a district where staple crops are to be raised it would be economical to allow a certain amount of flooding oftener than would be advisable on land where high-priced truck crops are to be raised, while in residence districts it would be very desirable to prevent all surface flooding. In addition to the damage to crops due to flooding, there are other factors to be considered, such as inconvenience to residents and the possible depressing influence on land values of floodings occurring even at infrequent intervals."

Effect of pumping from a shallow well on the ground-water table, W. W. Weir (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 7, pp. 339–357, figs. 16*).—Experiments conducted at the Kearney Park farm under the supervision of the California Experiment Station, in cooperation with the Office of Public Roads and Rural Engineering of the U. S. Department of Agriculture, are reported on the effect of pumping from a shallow well on the ground-water table and its relation to the drainage of irrigated lands.

"The results of this experiment lead to the conclusion that under soil, irrigation, and farming conditions such as are found on the Kearney Park . . . tract pumping from a shallow well does not lower the ground-water table sufficiently to afford drainage to any considerable area. In this experiment, although the water table in the sump was maintained at a depth of about 12 ft. below the ground surface and from 5 to 7 ft. below the normal ground water, the effect of the pumping was not appreciable beyond 100 ft. from the pump. Except within a very short distance from the pump, the ground water rose to a point as near the ground surface in 1915, while the pump was in operation, as it did in 1914, when no pumping was done. Seasonal variations are great enough to account for any differences observed.

"Contrary to the results obtained here, it has been found that the water table can be materially lowered by the use of tile drains for greater distances away from the drain than is shown in this experiment. . . . The fact that tile drains have proved more efficient than pumping from a well in lowering the ground-water table is due, no doubt, to the much larger area reached by the tile. . . . Thus, with such a system any lateral movement of water is more readily intercepted, and any vertical pressure is relieved at more points than is possible where tile is not used, even though the water table is maintained at a greater depth in the well than is done by the tile lines. It would appear,

therefore, from the results of these experiments that, although it has been proved feasible to reclaim water-logged land by means of tile drains, it would not be practicable to locate wells and pumping plants similar to the one described . . . close enough together to lower the water table over any considerable area or develop enough water for practical farm irrigation without storage.

"It is doubtful if the results of this experiment would have been materially different had it been located on the more poorly drained areas."

Farm drainage in Virginia, C. E. Seitz (*Va. Polytech. Inst. Ext. Bul. 15 (1917), pp. 35, pl. 1, figs. 18*).—This bulletin gives general but practical information on the planning and construction of tile drains and drainage systems, with special reference to Virginia conditions.

Irrigation works constructed by the United States Government, A. P. Davis (*New York: John Wiley & Sons, 1917, pp. XVI+413, pl. 1, figs. 128*).—It is the object of this work to give engineering descriptions of the U. S. Reclamation Service works together with illustrations. Chapters are included on the Salt River, Yuma, Orland, Grand Valley, Uncompahgre, Boise, Minidoka, Huntley, Lower Yellowstone, North Platte, Truckee-Carson, Carlsbad, Hondo, Rio Grande, Umatilla, Klamath, Belle Fourche, Strawberry Valley, Okanogan, Yakima, and Shoshone projects.

Reservoir capacity for small pumping plants, S. T. Harding (*Jour. Electricity, 39 (1917), No. 4, pp. 170–172, figs. 2*).—Curves of data are given on capacity of reservoirs required to maintain rates of discharge varying from 100 to 1,000 gal. per minute for periods varying from 6 to 96 hours, and also curves giving data on discharge of reservoir outlets for pipe sizes varying from 6 to 24 in. and head losses through outlets varying in size from 0 to 18 in.

Longevity of Bacillus coli in water, F. L. Rector and H. J. Daube (*Abs. Bact., 1 (1917), No. 1, p. 57*).—Sterile 1-liter bottles were filled with distilled water, tap water, and a bottled water and tested for *B. coli* with negative results. Each bottle was then inoculated with 0.5 cc. of a 24-hour broth culture of *B. coli*, plates being poured immediately and daily thereafter until negative results were obtained. Litmus lactose agar plates were used.

One day after inoculation there was a marked increase in the number of *B. coli*, but subsequent examinations showed a gradual and regular decrease which resulted in the final disappearance of the organism from the bottled water in 25 days and from the tap water and the distilled water in 48 days. By cultivating in dextrose liver broth the organism was found to be present in 50 cc. quantities in the bottled water until the thirty-sixth day, in the distilled water until the fifty-seventh day, and in the tap water until the sixty-fourth day.

Mechanical grading of concrete sand, O. R. Smith (*Concrete [Detroit, Mich.], 11 (1917), No. 3, pp. 76, 77, figs. 5*).—Tests are reported from which it was concluded that "the most dense and strongest mortar for concrete work is obtained if the sand has the following granulometric composition:" One-fourth in. sieve, residue none; No. 10 sieve, residue 60 per cent; No. 20 sieve, 80; No. 30 sieve, 85; No. 50 sieve, 90; and No. 100 sieve, from 95 to 98 per cent.

Motor gasoline: Properties, laboratory methods of testing, and practical specifications, E. W. Dean (*U. S. Dept. Int., Bur. Mines Tech. Paper 166 (1917), pp. 23, pl. 1; abs. in West. Engin., 8 (1917), No. 8, pp. 316–319, fig. 1*).—This pamphlet enumerates the desirable properties of gasoline and discusses types of gasoline marketed and the relative value of various tests used.

"Specific gravity in itself is of very slight significance in determining the properties of gasoline. It may serve as an index of other properties, particularly volatility, if knowledge is at hand regarding the source and method of production of a gasoline. The determination of gravity has been and probably always

will be one of the most useful tests that the refiner employs, but it is of but little value to the analyst who does not possess sufficient additional information to make proper interpretation of gravity results. . . .

"Volatility is the basic property that determines the grade and usefulness of a gasoline. . . . General consideration of the numerous factors involved has led to the following conclusions regarding the desirable characteristics of the volatility of motor gasoline: Gasoline should contain a moderate but not excessive proportion of low-boiling constituents, enough to permit easy starting of a cold engine but not enough to make evaporation losses excessive. Gasoline should have a total volatility range wide enough to include constituents that have a high, but not too high, boiling point. For economic reasons affecting both the individual user and the country as a whole, this volatility range should be such that the gasoline contains the largest possible percentage of the original crude oil. It should not, however, be wide enough to exceed the limits of the vaporizing power of the automobile engine."

In the proposed specifications for motor gasoline it is required that the color be water white and that acidity be totally absent.

"The gasoline shall, when distilled by the method described, meet the following requirements: (1) The temperature read on the thermometer when 20 per cent has distilled shall not be below 70° C. (158° F.) nor above whatever limit is fixed after due consideration of conditions of use. (2) The temperature read when 90 per cent has distilled shall not be above another limit similarly chosen. (3) The temperature read when 50 per cent has distilled shall not be higher than a mark half way between the 20 per cent and the 90 per cent limit. (4) The dry point shall not exceed the actual 90 per cent reading by more than 55°.

"Tolerance.—If either the 20 per cent or the 90 per cent temperature mark is above the required limit by an amount not exceeding 10°, the gasoline may be considered acceptable if the sum of the two temperatures read for the 20 and the 90 per cent marks do not exceed the sum of the adopted limits."

Distillation methods and apparatus are described and specifications given therefor.

Tractor facts for Oklahoma farmers (*Oklahoma City, Okla.: Oklahoma Farmer, 1917, pp. 37, figs. 49*).—This is a brief summary of information, favoring the use of the tractor on Oklahoma farms.

Harvesting and plowing simultaneously with a tractor, M. Ringelmann (*Bul. Soc. Encour. Indus. Nat. [Paris], 116 (1917), I, No. 3, pp. 595–599, figs. 2*).—The details of this procedure as practiced under French conditions are described. Experiments in 1916 showed that a hectare (2.47 acres) of grain could be harvested and bound and the ground plowed in 2 hours and 36 minutes at an expense for the tractor of about 26.54 francs ($5.12).

Handling silage, L. W. Chase (*Univ. Nebr., Col. Agr. Ext. Bul. 45 (1917), pp. 16, figs. 14*).—Devices for harvesting, hauling, unloading, cutting, placing, and removing silage are described and illustrated, with particular reference to pit silos under Nebraska conditions.

Utilizing exhaust steam for heating water and for pasteurizing (*U. S. Dept. Agr., Bur. Anim. Indus. Milk-Plant Letter 43 (1917), pp. 2*).—This is a mimeographed letter in which attention is called to the value of exhaust steam from milk plants for pasteurizing and heating boiler feed water. Data are also given showing how the coal bills of different plants vary according to the plant efficiency.

"The heating of feed water from 50 to 200° F. by the use of exhaust steam will directly reduce the fuel consumption by about 13 per cent. The actual saving in fuel, however, is greater than that, owing to the more even firing.

In addition to the saving in fuel the life of the boiler is prolonged on account of the avoidance of expansion and contraction strains set up in the boiler shell through the feeding of cold water. For every 10° the feed water is heated by exhaust steam before it enters the boiler, approximately 1 per cent of the fuel is saved. . . .

"To heat 300 gal. of milk from 60 to 145° requires about 30 lbs. of coal, so that with that amount of milk an exhaust steam heater would effect an annual saving of more than 5 tons of coal. . . . If 1,000 gal. of milk is cooled from 145 to 75°, 573,860 B. t. u. are added to the water. Assuming coal at 12,500 B. t. u. per pound and boiler and furnace efficiency of 50 per cent, the saving of the heat is equivalent to saving 92 lbs. of coal."

Farm potato storage in North Dakota, H. O. WERNER and P. E. CLEMENT (*N. Dak. Agr. Col. Ext. Bul. 11* (*1917*), *pp. 12, figs. 6*).—This bulletin describes and illustrates potato storage cellars which have been found efficient and moderate in cost in North Dakota.

Silos, F. M. WHITE (*Univ. Wis. Agr. Ext. Serv. Circ. 87* (*1917*), *pp. 24, figs. 17*).—General information regarding the planning of wooden and concrete silos is given in the form of questions and answers.

Running water in the farm home, C. E. SEITZ (*Va. Polytech. Inst. Ext. Bul. 19* (*1917*), *pp. 11, figs. 3*).—This is a brief popular bulletin describing well-known plans for obtaining running water in the farm home, but including bills of materials and cost data of special value to Virginia farmers and agricultural engineers.

RURAL ECONOMICS.

Important factors in the operation of irrigated Utah farms, E. B. BROSSARD (*Utah Sta. Bul. 160* (*1917*), *pp. 48, figs. 16*).—This investigation is based upon the 1914 farm business records of 309 irrigated Utah farms. Among the conclusions brought out were the following:

A greater percentage of capital is directly productive on farms with large capital than on farms with small capital. There is less waste land in proportion to the total farm area on the farms with large capital. Farms with large capital are more profitable than farms with small capital, as shown by the increase in labor income. This increases in the same ratio as farm capital until capital reaches $20,000 or over, but beyond this as capital increases 1 per cent, labor income increases only about 0.33 per cent. There are more acres of crops, on the average, on the large farms than on the small farms, but the proportionate area cropped is less. Horse and man labor with crops and live stock is more efficient on the large farms.

Over half of the labor income from the average irrigated Utah farm is increase in inventory of farm capital, and the most important increases in the farm inventories are in live stock and feed, which seems to indicate that Utah farmers realize the advantage of increasing the number of live stock on their farms. On an average the farms with the highest crop yields per acre are the most profitable. When average crop yields are maintained, the size of the irrigated Utah farm influences the labor income of the farmer more than increased crop yields per acre. The number of live stock and the net live stock receipts per productive animal unit affect directly the farmer's labor income—as either increases the farmer's labor income increases, and both are important factors in the operation of irrigated Utah farms.

The dawn of a new constructive era (*Proc. Cut-Over Land Conf. South. 1917*, *pp. 244*).—This is the report of a conference held in New Orleans, La., to discuss the cut-over land problem of the South, and devoted primarily to

considering various methods that might be used to bring the cut-over land into agricultural use.

Agricultural wages in Sweden, 1915, B. Nyström and J. G. Richert (*Stockholm: K. Soc. Styr., 1916, pp. 39*).—In this report are given for 1915 the systems of paying for work and the wages by types of work performed and whether on the yearly or daily basis. The information is also given by sex and for minor subdivisions.

[Data relating to agricultural contracts, 1914] (*Finlands Off. Statis., XXX, No. 5 (1916), pp. [4]+32+15*).—In this report data are given regarding laws and contracts relating to wages and labor under the old and new systems, and also to the rent and leasing of land, buildings, and forests. The data relate mainly to the renting of small farms and give the areas under various types of leases.

The high cost of living, F. C. Howe (*New York: Charles Scribner's Sons, 1917, pp. X+275*).—The author has discussed the high cost of living as it is dependent on the influence of the buying and selling of wheat in exchanges, the system of marketing live stock, cold storage, transportation, value of land, and the withholding of land from agricultural use. He also calls attention to the organization of the agricultural interests in Austria, Germany, Denmark, and Australia, and its effect upon prices and systems of agricultural practices.

Report of the committee on warehousing and storing of sugar, for the year ending September 30, 1917 (*Hawaii. Sugar Planters' Assoc., Rpt. Committee Warehousing, 1917, pp. 67*).—The authors include in this report information received from plantation managers as to the methods of warehousing and storing sugar, types of flooring and building, how ventilated, location with reference to the ocean trade-winds, percentage of the total crops which can be warehoused in an emergency, influence of methods of manufacture, influence of heat-resisting ferments on the keeping qualities, weighing automatically or by hand, methods of sewing bags, mechanical means of piling sugar in warehouses, and loss in weight in shipping to San Francisco and to New York.

Cold storage in Canada, W. F. O'Connor (*Ottawa: Govt., 1917, pp. 63*).—In this report are discussed cold storage conditions in Canada, indicating the classes and character of cold storage establishments, including abattoirs, and the margins of profit for 1916–17. The author concludes that the operations of cold storage companies generally have been fairly conducted and that the margins of profit have not as a rule been so high as during 1916. He points out that any reduction secured by lessening these margins would go only a short way toward lessening prices to consumers.

Cooperative marketing of eggs in Florida, Minnie M. Floyd (*Fla. State Col. for Women Ext. Bul. 16 (1917), pp. 27, figs. 12*).—The author discusses the methods of candling and marketing eggs, community egg circles, rules to be followed by producers in assembling, shipping, and finding customers. A model by-law and a constitution to be used by community egg circles are included.

Uniform cost accounting for milk distributors, E. A. Kracke (*Jour. Accountancy, 24 (1917), No. 6, pp. 424–429*).—The author discusses the factors to be considered in estimating the cost of milk distribution, such as sizes of bottles, classes of trade, system of delivery, and whether the monthly or annual cost is desired.

The community fair, J. S. Moran (*U. S. Dept. Agr., Farmers' Bul. 870 (1917), pp. 11, figs. 8*).—The author explains that "the community fair is a miniature county fair with the races, side shows, and other commercialized amusements omitted. It calls not only for the exhibition of the best products

that have been grown and the best work that has been done in the community, but also for games, athletic contests, pagents, and similar features of recreational or educational value. The community fair is most effective where the whole community is concerned in its management, though successful fairs, patronized by the greater part of the people of the community, are often held by the Grange, Farmers' Union, or other farmers' organizations."

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt., 3 (1917), No. 11, pp. 105–116, figs. 4*).—This contains a crop summary for November, 1917, and the usual estimate of crop conditions, estimate farm value of important products, average prices received by producers, and range of prices of agricultural products at important markets. In addition, there are shown data regarding the crop conditions in Florida and California, prices of alfalfa and clover seed, hop production and consumption, exports from the United States of leading cereals, potatoes, and meats, the frost damage to corn, the percentage of farm labor hired by the month and by the day, with and without board, the commercial acreage and production of cabbage, monthly movement of wheat from farms, crop prices and production, honey production in 1917, pecan production, a potato forecast by months, monthly wheat prices, wheat prices in England from 1259, etc.

Exports of raw cotton from the United States (*New York: National Bank of Commerce, 1917, pp. 13*).—This report discusses exports of cotton from the United States to the leading European neutrals, endeavoring to point out to what extent Germany has been able to obtain cotton by this means.

Economical notes on Brazil (*Rio de Janeiro: Min. Agr., 1916, 2. ed., pp. 93*).—This report contains discussions of the foreign trade in agricultural products for 1910–1914, and of the industries using agricultural products, the cattle industry, and immigration. The report contains a large amount of statistical data relating to the various topics treated.

Acreage under crops and the numbers and descriptions of live stock in each county and province of Ireland, 1916–17 (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis., 1917, pp. 29*).—By adding data for a later year, this report continues the information previously noted (E. S. R., 36, p. 494).

Agricultural statistics of Netherlands (*Dept. Landb., Nijv. en Handel [Netherlands], Verslag. en Meded. Dir. Landb., No. 3 (1917), pp. 132+XCI, fig. 1*).—This report gives data for 1916, with comparisons for earlier years, showing the acreage, yields, number of live stock, business of the credit organizations, insurance societies, extent of business conducted by rural banks, prices, imports, and exports, and discusses the weather and crop conditions and crop prices.

Agricultural statistics of France (*Ann. Statis. [France], 34 (1914–15), pp. 141–181*).—This continues data previously noted (E. S. R., 34, p. 291) giving statistics for later years.

Live stock statistics, P. Van Hissenhoven (*Internat. Inst. Agr. Rome, Internat. Crop Rpt. and Agr. Statis., 8 (1917), No. 10, pp. 808, 809*).—Statistical data are given showing the number of various classes of live stock on July 12, 1917, for Denmark, and on July 1, 1917, for France.

[Agriculture in Babira, Belgian Kongo], Lacomblez (*Bul. Agr. Congo Belge, 8 (1917), No. 1–2, pp. 52–72, figs. 9*).—In this article are described the population, soils, vegetation, methods of communication, and native crops of this district.

Agricultural statistics of Australia for 1905–06—1915–16 (*Commonwealth Bur. Census and Statis. Aust., Prod. Bul. 10 (1917), pp. 168*).—By adding information for later years, this report continues the data previously noted (E. S. R., 27, p. 595).

AGRICULTURAL EDUCATION.

The scope of home economics and its subject matter in universities and colleges, Alice Ravenhill (*Jour. Home Econ., 9 (1917), No. 9, pp. 393–404, fig. 1*).—The author offers comments and suggestions as to results which should have been attained after 40 years of widespread teaching in home economics and the reasons likely to account for the slow permeation of public practice by the teachings of home economics. In her opinion the latter may be due in part to an oversight of the fact that home economics is among the numerous contributory subjects of hygiene, and that too a large percentage of home economics students fail to grasp that the primary object is the promotion of health—physical, mental, and moral. Instead, their chief purpose has been rather the production of more economical yet equally attractive food, clothing, and shelter than hitherto. There has also been an omission on the part of graduates to assume a sufficiently influential position in social and civic life to diffuse by example and standard the tenets they profess.

In a comparison of the values assigned to the three main subdivisions of food, clothing, and shelter, and to household administration, it is found that less prominence is assigned to the last-named, although it actually contains the kernel of the whole course. It is suggested that the methods, whether in library, laboratory, or classroom, be reconsidered to the degree that fewer hours would be spent in future college courses in the actual preparation of food or in the mere setting of stitches. No attempt at what is usually miscalled "research" would be permitted except for postgraduate students. Standards of attainment would no longer be estimated by hours, but personal hygienic practice, the responsibilities of parenthood, the physical as well as the psychological development of children, the social and civic relations of the home must all receive more definite, more extended, and more suitably coordinated treatment than is at present the rule. The part played by the husband and father in family welfare must also be more accentuated. Much closer coordination must be cultivated between the divisions of home economics departments than is usually found. There should be no broad line of demarkation between what is described as household science and household art.

While specialization is necessary for the expert, such as the college and university teacher, it is deemed prejudicial to the student whose goal is family and institutional management, because it has a tendency to exaggerate a nonexistent distinction between so-called science of foods and the arts of clothing or shelter. A revision and rearrangement of some of the subject matter might also be of advantage. Further, the development of a higher standard in the broad cultural and historical aspects of the subject of hygiene and home economics in those who are in charge of these courses would foster that sense of perspective, that perception of the relation of the parts to the whole which maintains balance and adds technique and responsibility to the course.

The relation of home economics education to social hygiene, J. H. Foster (*Jour. Home Econ., 9 (1917), No. 9, pp. 405–411*).—The function of social hygiene as a protector of family and home brings it close to home economics education, at least in its broader sense as the author conceives the purposes and ends of such education. The opportunity of the home and school in social hygiene is briefly outlined.

Public instruction in cookery in London, K. Merrill (*U. S. Dept. Com., Com. Rpts., No. 270 (1917), pp. 666–668*).—The author calls attention to the present stimulation of instruction in cookery in and around London by the necessity for a certain amount of training for all housewives along the lines of economic cooking of war foodstuffs. In addition to the institutions charging tuition, a traveling motor-car kitchen maintained by the London County Council is available for the working-class people. This gives in each place six

demonstrations, a week apart, according to a prescribed syllabus including such subjects as substitutes for meat, wheat flour, sugar, catering for a week, kitchen economies, fuel-saving devices, etc.

To fill the needs for training in domestic economy for times of peace, the council has provided courses in cookery, laundry work, and housewifery in both day schools and evening institutes. Children between the ages of 5 and 14 years are required to attend these schools and the course in domestic science is taken in the last two years of their attendance. One-half day each week is devoted to the subject, although in certain districts pupils are withdrawn, either entirely or at least half the week, from school duties during a period varying from three to six months in their last year at school, so that they may pursue the domestic work under as realistic conditions as possible. In January, 1917, the 178 cookery centers, 56 laundry centers, 128 combined cookery and laundry centers, and 72 housewifery centers provided places in all for 65,500 children. The evening institutes are attended by persons of all ages from 14 to 60. Their plan of teaching is elastic and the subject is never considered of more value than the development of the economic power of the individual. Special courses of lessons may be arranged for war-time meals.

Various polytechnic institutes, supported by the authorities and the reasonable tuition fees, supply finishing and advanced courses in all subjects of domestic science. They require for entrance a thorough grounding in the elementary subjects. Special courses of wide range are provided in trade subjects for apprentices or domestics who can attend only at night.

Scholarships in cookery are provided for candidates between the ages of 17 and 35 years who have been in domestic service at least 1 year, providing 12 weeks' instruction under a qualified chef, a meal every school day, and about $25 toward traveling expenses. In order that a proper perspective may be maintained through the whole instruction, a free course in experimental science is given in connection with the cookery classes.

Federal aid for vocational education: A report to the Carnegie Foundation for the Advancement of Teaching, I. L. Kandel (*Carnegie Found. Advanc. Teaching Bul. 10 (1917), pp. VI+127*).—Part 1 of this bulletin presents a legislative history, based on the discussions in the *Congressional Record*, of the acts of Congress of 1862, 1890, and 1907, for the establishment and development of colleges of agriculture and the mechanic arts, and of the agricultural experiment station appropriations of 1887 and 1906. It is alleged that there was an absence of any serious educational program in this legislation, either on the part of Congress or Senator Morrill himself.

Part 2 comprises studies of precedents for Federal aid for education and of the constitutional authority of Congress to dispose of public lands for educational purposes, and a brief history of the movement for Federal aid for agricultural education in this country and of higher agricultural education in Europe up to 1851. The author contends that (1), "the recognition of the value and importance of agricultural and industrial education was already widespread when Senator Morrill became associated with the movement; and (2), that the advocacy of Federal aid in support of this type of education had been persistent for a number of years before the act of 1862 was passed."

Part 3 discusses the subsequent legislative developments, taking up the Agricural Extension Act of 1914 and the Federal Aid Vocational Education Act of 1917. The author maintains that "the one large experiment in the provision of Federal support for education, the Morrill and supplementary acts, failed for nearly 40 years, and the failure was due to the absence of an educational policy. Only when the States really took up the objects, and only when a general social demand arose, was success possible."

Statistical data showing the whole number of graduates in branches relating to agriculture, mechanic arts, and science and classics in the land-grant colleges in 1872–73, the distribution of students in land-grant colleges in 1894–1914 in agriculture and mechanic arts, the percentage of total distribution of the expenditures of the land-grant colleges from 1903–1915, income of land-grant colleges according to sources from 1892–1915, and Federal aid now available to the colleges under the various acts are included, as well as tables presenting the development of the curriculum of three agricultural colleges (Pennsylvania, Michigan, and Illinois) at approximately 25-year intervals.

"The vagueness of aim during the first 30 years following the passing of the Morrill Act is well brought out by the uncoordinated mass of subject matter, for which it would be difficult to find justification in the philosophy of education or in the practical needs of the agricultural profession. The tendency since 1890 has been toward differentiation and specialization. Much has been eliminated that was not pertinent, a better conception has been formed of the cultural needs of the agricultural specialists, and finally, the practical and scientific needs of the farmer have been well coordinated. The modern agricultural college presents not merely an array of subject matter that was impossible before the development of the sciences on which agriculture depends, but a large number of specialized courses."

An introduction to the bulletin by H. S. Pritchett, president of the Carnegie Foundation, contains a serious arraignment of the policy and results of Federal aid to agricultural education. He declares that "it is not too much to say that for the first 50 years of their existence the colleges thus established did very little to advance the interests of agriculture or to minister to the needs of the young men and young women on the farm. It is only within the last few years that they have addressed themselves directly to this problem."

State-aided vocational education: A résumé of ten years' progress. [Statistics of vocational education] (*Ann. Rpt. Bd. Ed. [Mass.], 80 (1915–16), pp. 128–165, 261–301*).—A 10-years' résumé of vocational education in Massachusetts includes the conclusions of the Douglas Commission on Industrial and Technical Education in 1906 and comments thereon in 1916. Public vocational education of secondary-school grade in Massachusetts may be claimed to be the result of the report of this commission. It considered the problem of vocational education from the side of the industries and the adult workman and from the side of the children who were to enter the industries of the State.

The article also reports on the present status of State-aided vocational education and home economics training in Massachusetts. The agricultural education is being given by 3 county vocational agricultural schools, a separate agricultural day school, at Northampton, doing the same type of work and receiving State aid under special acts of the legislature, and 15 agricultural departments in connection with high schools and academies. In Norfolk County the board of education is maintaining a central agricultural school of moderate size (established in 1915–16), and supporting it at the most distant points in the county by branches consisting of 1-teacher agricultural departments in high schools. In 1915–16 the total enrollment in the separate schools was 274, including 39 nonresidents, and in the departments, 223 students including 74 nonresidents.

By the provisions of an act of the 1916 legislature, 36 cities were authorized to maintain schools of agriculture and horticulture for families and individuals, the instruction being subject to the approval of the State Board of Education. The board believes that vegetable and fruit growing, poultry keeping, and possibly the production of milk and honey may be taught families not by book or lecture method, but by personal instruction and supervision.

The total earnings of vocational agricultural students in the agricultural schools and departments from farm and other work during the periods covered by their school attendance and their farming projects have increased from $11,100 in 1912 by a total of 70 pupils, in 3 schools and 10 departments, to $84,173 by a total of 497 pupils in 3 schools and 13 departments in 1916. The total outlay for State-aided vocational education was $1,632,379; net maintenance, $2,350,088; and reimbursement, $1,315,946. This includes for agricultural schools an outlay of $266,708, net maintenance $198,082, and reimbursement $105,517; and for agricultural departments an outlay of $7,933, net maintenance $50,450, and reimbursement $39,176. The cost of outlay has been borne entirely by municipalities and counties and the cost of maintenance by municipalities, counties, and the State.

Nine all-day schools of home economics have been established with a total enrollment of 669 pupils, and embracing work in marketing, preparing and serving meals, buying, making, repairing, and caring for clothes, the furnishing and care of the home, the nurture and care of children, home nursing, application of art and literature in the development of the home, and nonvocational subjects for training in citizenship and general culture. The vocational programs of these schools have been required to occupy 80 per cent of the pupil's time, and the general improvement portion of the program the remaining 20 per cent. In a number of these schools substantial progress has been made in partly supervised and carefully organized home project work. Instruction in household arts in evening schools is also given. The total outlay for day household arts classes was $132,542, net maintenance $209,589, and reimbursement $119,599; for evening household and practical art schools, total outlay $6,679, net maintenance, $138,776, and reimbursement $71,476.

State-aided vocational agricultural education in 1916 (*Bul. Bd. Ed. Mass., No. 5* (*1917*), *pp. 17*).—This is a reprint of that portion of the preceding abstract relating to agricultural education.

A suggested course of study for county training schools for negroes in the South (*Trustees John F. Slater Fund Occas. Papers, No. 18* (*1917*), *pp. 73, figs. 56*).—This publication embodies the report of a committee appointed at a meeting of State agents of rural schools for negroes held in Nashville, Tenn., in March, 1917. It contains outlines of industrial courses in (1) handwork, manual training, and shopwork, (2) home making, (3) drawing, and (4) nature study, gardening, and agriculture, as well as science courses in health, geography, and general science, and a description of the subjects given. The work is organized on the five-two-three plan, i. e., five years of primary work, two of elementary work, and three of secondary work.

The purpose of the primary work is to give a working knowledge of the "3 R's," manual dexterity, specially in handling and utilizing native materials, and an elementary knowledge of the common industries of the home and farm. Gardening is taught both to boys and girls for its educational value as an introduction to practical science and for its economic value in the home. Home garden and pig projects are recommended. The girls receive one year's instruction in sewing in the fourth year and one in cooking in the fifth year.

The object of the elementary course is to give a broader knowledge of the common-school studies, together with two years of practical training in industrial work for boys and girls. The agricultural work includes text-book work and field practice in the growing of some staple farm crops, while the course for girls includes sewing, cooking (including canning and preserving), and the care of the home. Corn and poultry home projects are recommended for boys and girls respectively.

In the last three years, or secondary course, the work is differentiated as a home-makers' course for girls, a farm-makers' course for boys, and the rural teacher-training course. The agricultural work is a continuation of that begun in the elementay course and includes a simple study of soils and fertilizers, the principle of crop rotation, the study of farm animals, feeds and the principles of feeding, common fruit trees, insect pests, and plant diseases. Instruction is also given in elementary farm blacksmithing, carpentry, brick laying, and concrete work. The girls' work consists of dressmaking, first aid, elementary nursing, the care of infants, preparation of family meals, and house planning and decoration. The work in teacher training consists of the principles of teaching and school and class management, with special reference to rural conditions and practice teaching.

The schools have increased from 8 in 1914 to 17 in 1915, 27 in 1916, and 42 in 1917. While the schools work under the immediate direction of the county school boards and superintendents, the State boards of education keep in close touch with them through the State agents of rural schools for negroes who serve the schools as advisors and supervisors. To aid in the establishment of these schools the trustees of the John F. Slater fund have voted an appropriation of $500 to each for maintenance. The school property must belong to the State, county, or district, and the school be a part of the public school system. There must be an appropriation for maintenance of not less than $750 from public funds raised by State, county, or district taxation, and the teaching must extend through the eighth year, with the intention of adding at least two years as soon as it shall be possible to make such extension. Nearly all of these schools have also been assisted in the past three years with appropriations from the General Education Board for equipment, particularly for industrial training.

Swine-judging suggestions for pig-club members, J. D. McVean and F. G. Ashbrook (*U. S. Dept. Agr., Office Sec. Circ. 83* (*1917*), *pp. 13, figs. 4*).—This circular, intended mainly for the beginner, contains a brief study of the lard and bacon types of swine and the market and breeding classes of hogs, an explanation of the principal points of the score card and its use, and suggestions for conducting judging contests.

MISCELLANEOUS.

Twenty-third Annual Report of Montana Station, 1916 (*Montana Sta. Rpt. 1916, pp. 151–193*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1916, and a report of the director on the work and publications of the station. The experimental work reported is for the most part abstracted elsewhere in this issue.

Twenty-ninth Annual Report of Rhode Island Station, 1916 (*Bul. R. I. State Col., 12* (*1917*), *No. 4, pp. 17–24, 32, 33*).—These pages include a report of the director and a financial statement for the fiscal year ended December 31, 1916. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Twenty-sixth, Twenty-seventh, and Twenty-eighth Annual Reports of Tennessee Station, 1913, 1914, 1915 (*Tennessee Sta. Rpt. 1913, pp. 139–164, figs. 9; 1914, pp. 265–287, figs. 6; 1915, pp. 111–133, figs. 9*).—These reports contain the organization lists, reports of the director and the various departments, the experimental features of which are for the most part abstracted elsewhere in this issue, and financial statements for the fiscal years ended June 30, 1913, 1914, and 1915.

Monthly Bulletin of the Ohio Experiment Station (*Mo. Bul. Ohio Sta., 2* (*1917*), *No. 11, pp. 349–383, figs. 15*).—This contains several articles abstracted elsewhere in this issue and notes.

NOTES.

Delaware College.—Howard T. Ruhl, State leader of boys' and girls' clubs, resigned January 1 to become professor of agricultural education under the Federal Vocational Education Aid Act and was succeeded by Theodore T. Martin.

Idaho University and Station.—*Breeders' Gazette* announces that Dean E. J. Iddings has been appointed head of all agricultural activities at the institution, including the station and extension work.

Purdue University.—A four-weeks' course in dairying has been offered to women to prepare them to fill positions in factories manufacturing dairy products. This course included the testing of milk and dairy products, the making of soft cheese and ice cream, dairy bacteriology, general dairying, and lectures on food production.

Maryland College and Station.—The resignations are announced of D. G. Sullins as associate animal husbandman to accept a position on the extension staff of the Connecticut College, S. E. Isacson, D. V. S., as animal pathologist in charge of the hog cholera serum laboratory to engage in commercial work, G. H. Cale as apiculturist to accept a position with the U. S. Department of Agriculture, C. E. Leathers as assistant botanist to become county agent of Dorchester County, J. M. Arthur as assistant plant pathologist to go into the Army, and O. C. Bruce as professor of soils to accept a commercial position as tractor demonstrator. L. W. Erdman has been appointed assistant in the soil laboratory, and Whitney J. Atcheson, assistant agronomist.

Minnesota University and Station.—The new beef cattle barn, to replace the structure burned last summer, is practically completed. It is 60 by 120 feet with a wing 36 by 120 feet. The portion to be used as a stable is built of hollow tiles with reinforced concrete. Above this, wood with stucco finish is used for the portion intended for storing feed and hay. Two hollow tile silos adjoin the stable, and the wing contains a laboratory for class work and demonstration. The total cost is about $25,000.

Arrangements were made whereby students wishing to leave college prior to the close of the second semester could take double work in certain subjects up to April 15 and receive credit therefor. About 50 students registered for the special work thus provided.

The name of the division of economic zoology has been changed to that of entomology and economic zoology. Dr. William A. Riley, professor of insect morphology and parasitology at Cornell University, has been appointed professor of entomology and parasitology and chief of the division beginning February 1. A. G. Ruggles, associate professor of entomology and associate entomologist, has been made associate professor of entomology and station entomologist.

Three new courses in agricultural education are announced, beginning with the second semester. These deal respectively with agricultural statistics and graphic representation, the history of agriculture, and the visual presentation of material. W. H. Bender, associate professor of agricultural education, has resigned to become State director of vocational agricultural education in Iowa and secretary of the board of vocational education. Percy B. Barker, head of the department of agronomy at the University of Arkansas, B. M. Gile, and

Albert M. Field have been appointed assistant professors of agricultural education, and John V. Ankeney, instructor in that subject.

Other appointments include I. D. Charlton, extension professor of agricultural engineering at the Washington College, as assistant professor of farm mechanics beginning January 15; William A. Billings as assistant pathologist of the station, beginning February 1; Gibson G. McKnight as laboratory assistant in plant pathology; and Lionel H. Laurence as mechanic and laboratory assistant in agronomy and farm management.

Montana College and Station.—C. N. Arnett, head of the animal husbandry department, has been granted leave of absence for service in France with the American National Red Cross. It is understood that his work will have to do with the rehabilitation of the live-stock industry in France in the vicinity of the base hospitals. It is hoped to establish a farm near each hospital to be operated to some extent by partly crippled and convalescent soldiers.

Nevada University and Station.—Dr. Edward Records, assistant bacteriologist, has been appointed director of the State veterinary control service and chief of the department of veterinary science in the station, effective March 15. Dr. Lewis H. Wright, assistant professor of veterinary medicine at the Texas College, has been appointed assistant veterinarian in the station, effective April 15.

Dr. C. A. Jacobson, professor of agricultural chemistry and chemist, has resigned, effective June 30. N. F. Peterson, instructor in botany in the South Dakota College, has been appointed assistant in range management, and George Hardman, assistant agronomist, both appointments being effective April 1.

New York State Station.—Everett P. Reed, assistant agronomist, has resigned to accept an appointment as farm bureau agent in Ohio. George H. Howe, assistant horticulturist, has enlisted in the Medical Corps.

Rhode Island Station.—W. C. Irons, assistant in field experiments, and H. A. Johns, assistant in chemistry, have resigned to enter military service. F. K. Crandall has been appointed asssistant in field experiments beginning March 1.

L. P. Howard, assistant in chemistry, died February 24, at the age of 25 years. He was a 1914 graduate of the Massachusetts College and had been in the employ of the station since graduation.

South Dakota College and Station.—James H. Shepard, professor of chemistry and station chemist since 1888, died February 21 in Florida at the age of 68 years. Prof. Shepard was a graduate of the University of Michigan in 1875, and for many years was engaged in high-school teaching and as superintendent of schools. He served as vice president of the college from 1890 to 1900 and was director of the station from 1895 to 1901. His textbook entitled Elements of Chemistry, appearing in 1885, has been extensively used, and he was also the author of a considerable number of bulletins dealing with the chemistry of forage plants, sugar beets, macaroni wheat, etc. He was a prominent witness for the Government in the bleached-flour cases, and well known as an expert on the chemistry of wheat and its products.

Washington College and Station.—A quarter section of land at Waterville has been leased for 20 years for carrying on forage and cereal investigations. R. Page Bledsoe, instructor in farm crops at the Kansas College, has been appointed specialist in forage crops in charge of this tract.

Dr. C. A. Magoon, associate professor of botany and bacteriology, resigned February 15 to accept a position with the Horticultural and Pomological Investigations of the U. S. Department of Agriculture. William Hislop resigned as animal husbandman, March 1, to engage in commercial work.

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THE AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES.

U. S. DEPARTMENT OF AGRICULTURE
STATES RELATIONS SERVICE
A. C. TRUE, DIRECTOR

Vol. 38 | APRIL, 1918 | No. 5

EXPERIMENT STATION RECORD

WASHINGTON
GOVERNMENT PRINTING OFFICE
1918

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U. S. Department of Agriculture.

[1] Printed in scientific and technical publications outside the Department.

EXPERIMENT STATION RECORD.

VOL. 38. APRIL, 1918. No. 5.

In the midst of the storm and stress of war active attention is already being given in Europe to the subject of reconstruction after its close. It is natural that agriculture should figure prominently in these plans, for the events of the past three years have given it a new place in the life of nations and have brought a new realization of its relationship to national welfare and security. The necessity for a definite national policy which will stimulate and promote that industry has been impressed upon the public mind in those countries as never before.

Furthermore, the unusual steps which have been taken toward production as a war measure have prepared the way for future changes of a radical character. The precedents of hundreds of years have been swept aside almost over night. There has been a remarkable and convincing demonstration of the effects of past neglect, and the idea of the interest of the whole people in the use made of the land as a national asset has developed out of stern experience and found speedy recognition.

British statesmen have declared that no government would again neglect agriculture as it had been neglected in the past; and the change of attitude has been well put by the secretary of the Board of Agriculture for Scotland, who said: "In short, a new outlook has been compelled by the war. The essential value of agriculture and forestry to the country is at last realized. The national danger involved in their neglect is at last appreciated; their complementary character is at last understood."

In a book entitled Agriculture after the War, published about a year ago, Mr. A. D. Hall, former director of the Rothamsted Station, frankly expressed the need for the adoption by the State of a considered agricultural policy for the better utilization of the land. His text was the need for an increased production of food at home, and the greater employment of men upon the land as essential to the security of the nation as a whole. This need was made independent of the particular interests of either landowners or farmers, and embodied the rather novel conception that a man owes responsibility to the community for the way he conducts his business in farming.

More recently another book has appeared, entitled British Agriculture—the Nation's Opportunity, which is based on the minority report of a committee appointed by the British Board of Agriculture, on the employment on the land of discharged soldiers and sailors. The book contains an introduction by Mr. A. D. Hall, who explains that it is the first effort appearing under public authority to set out a program for the reconstruction of rural life. It represents a considerable revolution in public opinion with regard to the position of agriculture in the United Kingdom, obscurely progressing for many years but suddenly strengthened and crystallized by the war, until "there are few people who now have not been taught by events that agriculture must be revivified in the national interest." The uncertainty of disturbed economic and industrial conditions after the war directs attention, as he says, to the land as the great undeveloped asset of the nation, the prime source of wealth and the first link in the whole chain of industries.

Granting the case for the reconstruction of agriculture, the elements of the process are described as threefold—the establishment of such a level of prices as will render intensive farming possible, the improvement of the position of the laborer, as regards wages, housing, and the amenities of life, and, lastly, the recognition that ownership of land carries with it a duty to the community.

The British Government has had for some time in operation a Ministry of Reconstruction, with a large number of commissions and committees—some eighty-seven in all—to deal with questions which will arise at the close of the war. Under the section of agriculture and forestry, four committees are included, namely, on agricultural policy, forestry, land settlement, and horse breeding. There are also committees on cold-storage research and on food research, to deal respectively with the problems of the preservation of food, and with the cooking of vegetables and meat, and bread making. For the cotton industry, there are committees on cotton growing within the Empire, Indian cotton, and research and education for the cotton industry, with a view to the organization of a research association. These committees have been in active operation for some little time, and a number of them have already made preliminary or partial reports.

A committee of special interest is that on agricultural policy, appointed by the Prime Minister in August, 1916, and headed by the then president of the Board of Agriculture. The committee includes, among others, such well-known men as Mr. A. D. Hall, Mr. R. E. Prothero, the present president of the Board of Agriculture, and Sir Horace Plunkett. It was charged with considering and reporting upon the methods of effecting needed increase in home-grown

food supplies, having regard to the need for such increase in the interest of national security. It has rendered a partial report which illustrates how deeply Great Britain has been stirred in this matter and how decidedly the events of the war have altered the attitude toward the agricultural industry.

In spite of the depleted condition of agriculture at the outset of the war and the continued dependence of the country on imported food, the conviction is expressed that a large proportion of the imported food of Great Britain which is capable of being grown there could be produced in the islands, if a complete policy for the State were adopted and consistently carried out. The report declares that "the State must adopt such a policy and formulate it publicly as a future basis of British agriculture, and explain to the Nation that it is founded on the highest considerations of the common weal."

The war has shown, as the report states, that methods and results of land management and of farming are matters involving the safety of the State, and are not merely the concern of individual interests. "The agricultural land of the country must gradually be made to yield its maximum production," and this implies a large change from permanent grass to arable cultivation. While many factors are recognized as being involved in a scheme of agricultural policy, a basis of security and stability of the conditions under which agriculture is to be carried on in the future is placed at the foundation of the whole structure.

"The conditions of agriculture must be made so stable that out of its profits the agricultural laborers can be assured a fair wage, the cultivator of the soil a fair return for his capital, energy, and brains, and the landowner a fair return for the capital invested in the land." To accomplish this end, it is recommended that the State should fix mimimum wages for the ordinary agricultural labor, determined by wage boards, and guarantee to the farmer a minimum price for wheat and oats. Furthermore, if it should be found advisable to adopt a tariff on manufactured goods, it is urged that one should be imposed on imported foodstuffs, such as dairy produce, meat, and "corn," and special consideration shown to products of the more intensive forms of agriculture involving large invested capital and unusual expense for labor and cultivation. Unless the farmer is assured against a recurrence of the prices of 1894–95, it is anticipated that the process of seeding down arable land to grass will recommence immediately after the war, notwithstanding high prices.

As to the method of securing efficient production, the report recommends a general survey of the conditions of agriculture throughout the United Kingdom, conducted by the boards and departments of agriculture, with provision for eventually bringing about the proper use of land which is found not to be utilized to its full extent

for the production of foodstuffs or timber. This provision might even involve the temporary taking over of an estate or parts of it where necessary, to be managed by the Board of Agriculture until the desired improvement had been accomplished. "It must be clearly understood," the report states, "that henceforth bad farming is a danger to the State, and that the waste of good land on game or games is inconsistent with patriotism. . . . Estates must be managed with a single eye to maximum production," and capital must be attracted to the industrial equipment and improvement of the land and to the operations of intensive farming.

It is interesting to note as one of the fundamental requirements in carrying out such a scheme for enlarged production that it is considered essential that the country "be permeated with a complete system of agricultural education." In addition to providing security against loss, it is realized that farmers must have placed at their disposal the best available scientific and practical advice. "Indeed, it will be impossible to carry out the scheme (except with serious loss and wastage) unless it is accompanied by an important development of the facilities at present available in the United Kingdom for agricultural education, technical advice, and research." This, it is explained, would also include demonstrations of improved methods and their financial soundness.

These latter subjects, although mentioned, are considered of such importance that their consideration is deferred to a subsequent part of the report. The discussion of them will be awaited with much interest. Many articles in the British press and reports on other branches of reconstruction give evidence of increased appreciation of science and technical education, which it is expected will find expression in the plans now being formulated. For it is now too manifest to require argument that agricultural progress and sound agricultural teaching and practice must rest on agricultural inquiry and its application.

A minority report, while taking exception to some of the proposals advanced by the majority, lays special stress on agricultural education and demonstration. Efficiency is the keynote of the situation, the writer says; "give the farmer information, acquaint him with the reason of things, and you will give him the most wholesome kind of State aid." He advocates placing technical instruction and agricultural education under the jurisdiction of the departments of agriculture; "a million pounds, or a much larger sum if necessary, annually spent in this way would repay the expenditure tenfold." Instruction is advocated which is brought down to the farmer and enlists his interest. "Demonstrate to him on his own land, even keep his books for him for a time if necessary, but leave him with no excuse for ignorance."

Expressions like this have a familiar sound in this country, for they reflect the spirit and the conviction upon which our system of State and Federal aid has been built up.

In spite of the terrible ordeal through which France is passing, reconstruction work is already under way and plans are actively being made for future activity at the close of the war. These plans as related to agriculture look toward the amelioration of the condition of the farmers, the regeneration of agricultural communities, and a more highly intelligent use of the land as a result of enlarged means for acquiring and spreading agricultural knowledge. These movements speak eloquently of the enterprise, the foresight, and the undaunted courage of the French people.

The work of reconstructing the devastated parts of France has been proceeding actively for over a year under the leadership of the head of the Office of Agricultural Reconstruction. The industry has been aided by provision for the purchase and resale or allotment of seed, fertilizers, nursery stock, cattle, etc., by the introduction of farm motors for plowing and cultivating, and in many other effective ways. Through the French Ministry of Agriculture and the agricultural cooperative societies, unusual credit facilities have been provided farmers for rebuilding, restocking, and restoring their farms to productive condition. Much interest attaches to the published articles in the press and scientific journals from leaders in agricultural thought in that country, in relation to the measures for rehabilitating agriculture after the war. Among the plans to that end, increased facilities for agricultural research have figured prominently.

Reference was made in a previous issue to the report of a commission of the French Academy of Science, which laid stress on the necessity for reorganizing the whole system of research, instruction, and assistance in agriculture in that country. Since then other papers dealing with the subject have appeared under different auspices, showing how widespread is interest in the subject, and testifying to the confidence which is felt in the effectiveness of research as a means of advancement. Reference may be made to two of these papers by men whose names are familiar to us in this country.

In a communication to the Academy of Agriculture of France, Prof. Edmund Gain, director of the Institute of Agriculture at the University of Nancy, discusses the means for increasing agricultural production and outlines a plan for the reorganization of a series of agricultural stations in the various districts on a somewhat novel plan. He regards the reestablishment of the agricultural industries on a firm basis after the war as the only way in which the country

can recover itself. The average production of such staple crops as wheat, oats, and potatoes, is shown to be much less than that in neighboring countries, the remedy for which lies in selection of suitable varieties and their improvement, the efficient use of fertilizers, and cultivation. To accomplish these requires a sufficient fund of reliable knowledge on the part of the farmer, proper equipment in tools and machinery, and adequate capital, and it is along these three lines that it is proposed to develop stations to aid the farmers.

The proposed organization divides the work of the stations into two main divisions, namely, the scientific division for conducting experiments and researches in the whole range of agricultural science, and the exercise of control over fertilizers, feeds, etc.; and the division of rural economy, to include a bureau of information, rural instruction, marketing, agricultural labor, the cooperative purchase of machinery, maintenance of demonstration farms, and a section for farm credit. The latter would be provided with funds through the aid of large landed proprietors of the district, which would be loaned to the farmers in small amounts on the security of their growing crops.

Ten stations organized on the above basis are proposed, each with a government grant of $30,000, to be supplemented by funds subscribed or loaned by local capitalists and landowners. The plan is comprehensive, and except for the loan feature is not very different from a union of our own station and extension departments.

At a conference presided over by the French Minister of Agriculture, M. Georges Wery, vice director of the National Institute of Agronomy at Paris, presented an able paper on agricultural research institutions in France and other countries, with plans for the reorganization of the French stations. He justly pays a high tribute to the product of agricultural research in France in the past, but explains that of late the experiment stations have become absorbed to increasing degree in analytical and control work, to a point which is seriously affecting their activity as research institutions.

The present system for the support of the stations favors the growth of analytical work, the officers receiving a portion of the fees as supplements to their salaries, and the department in which the station is located profiting by this source of revenue. The growth of this line of activity has, as M. Wery states, diverted the stations from their original purpose of agricultural research, for the number of workers being small the time left for investigation is greatly reduced. He argues for a separation of the control and regulatory functions of the stations from their research, and a larger and more adequate budget. pointing to the experience of other countries in this respect and to the generous support of experiment stations in the United States and Germany particularly.

Another weakness cited in the present organization of the French stations is their local character, the tendency being to work on questions of quite local interest rather than on broad agricultural problems, and their lack of organization into a coherent system. Certain of the stations have originated with the Ministry of Agriculture, others have sprung from the Ministry of Public Instruction, and still others from the various departments of the country. Moreover, the stations taken as a whole are restricted in the scope of their activities, leaving several important branches of agriculture dependent for progress upon the research of other countries. "We still cling to the original conception which gave rise to the first laboratories, i. e., the study of soils and fertilizers. We do not seem to have followed the evolution of scientific agriculture. We seem to neglect the more difficult problems of biology which offer such large promise."

The system of experiment stations for which M. Wery argues is a well-knit system, drawn together by organization and mutual interest, supported jointly by the State and the locality, connected mainly with the agricultural schools and institutes, and developed along the lines of the principal needs for investigation in the districts in which they are located. They would include specialists in the important branches of agriculture, with the control work organized so as not to conflict with the investigation. He believes such a system would be preferable to the large number of laboratories inadequately manned and supported.

The rôle which the State should play in respect to these agricultural research institutions is strongly emphasized, for they are declared to exercise a fundamental relation to the development of a principal source of national wealth and security upon which in time of war the very life of the nation may depend.

The contention that the stations should be connected with institutions of learning is thoroughly sound. This not only places them in the proper atmosphere, develops the spirit of research, and encourages the coordination of the groups of specialists, but, as M. Wery points out, it establishes the proper relationship between research and the higher grades of instruction, directs young men to the field of agricultural investigation and encourages them to prepare for it, and it extends the range of usefulness and influence of the schools themselves, giving them standing in the scientific world as well as in the industry.

The advantage of this association of the stations with colleges or schools has been illustrated wherever followed, but nowhere more forcefully or convincingly than in this country. Here the benefits have been so manifest with increasing time as to remove any doubt of the wisdom which led to the provision, at a period when there was much precedent and argument for separate stations. While the real

advantages came somewhat slowly, they long ago fully justified the restriction carried in the original measure.

Both of these papers, and others which have gone before, pay high tribute to the American stations. Not only is the example cited of their liberal support, but many approved features of their organization and profitable results of their activity are pointed out. M. Gain pronounces the funds assigned to them among the most productive of Government expenditures. M. Wery commends them in terms which are highly complimentary, both for the efficiency of their organization and their comprehensive scope, including, as he says, nearly five hundred distinct laboratories, each working in a particular line but all converging to the same end, the progress of agriculture in its various branches. He contrasts their large revenues with those of the stations and laboratories in his country, citing this as an example of wise and profitable use of governmental funds.

Gratifying as this is, the large financial support which is always cited to the advantage of the American stations carries with it large expectations as to the returns to be made for these ample means and opportunities. These world expectations can not be met unless the personnel is maintained upon a high plane of efficiency and the funds are carefully conserved for investigation and experiment. Even then the broad extent of country to be covered, the great diversity of questions, some of them quite elementary as a result of the settlement of new country, and the necessarily expensive character of investigation in certain lines, are likely to be unappreciated.

While therefore European countries are planning for reconstruction to include the development of their agricultural research institutions, the American experiment stations may well consider how their work and organization may be made more productive and effective in meeting after-war conditions, in full accord with the abundance of their opportunity.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The relation of some of the rarer elements in soils and plants, W. O. ROBINSON, L. A. STEINKOENIG, and C. F. MILLER (*U. S. Dept. Agr. Bul. 600* (*1917*), *pp. 25, figs. 3*).—An earlier publication (E. S. R., 31, p. 719) included a chemical analysis of certain important American soil types for the presence of the rarer elements. The purpose of the present bulletin was to determine the content of the rarer elements present in plants grown in soil of known composition and to establish the relationship between soil and plant composition. References to previous work along the same line are included.

So far as possible, the plants selected had grown on soils previously analyzed and differing widely in composition. Legumes, vegetables, grasses, trees, and shrubs were included in the investigations. The methods of analysis are given in detail and the results tabulated. In order to keep the temperature fairly uniform during the ashing an electric furnace with a temperature regulator was designed. The essential part of the automatic control was a couple consisting of a quartz tube closed at one end, inside of which was placed a nickel rod. Diagrams and a description of the furnace and regulating devices are given.

Of the rarer elements, lithium was found in all the plants examined, rubidium in the majority of cases, cæsium in the ash of timothy, raspberry, and beets grown in localities where the soil is known to contain cæsium beryls. Chromium was found occasionally but in small amounts, vanadium in only a few cases, and molybdenum not at all. Barium was present in all plants and strontium in all except bean seeds. Titanium was found in very small amounts in all plants, and aluminum in all but two, pine needles being very high in this element.

It was found that manganese in plants varied in amount more than most of the other elements and that a large amount of rare alkalis was generally accompanied by an abnormal amount of manganese. There were wide variations in the composition of the same kind of plant, but it is the opinion of the authors that "the most profound influence the composition of the soil has on the plant is not on the composition of the plant but on the occurrence of that plant on the soil."

With the possible exception of sulphur, chlorin, and manganese, there was no indication that the elements determined, except those commonly used, need be considered in fertilizers.

The influence of carbon monoxid on the velocity of catalytic hydrogenation, E. B. MAXTED (*Trans. Faraday Soc., 13* (*1917*), *No. 1–2, pp. 36–42, figs. 4; Chem. News, 117* (*1918*), *No. 3038, pp. 73–75, figs. 4*).—This article reports the results of investigations on the effect of carbon monoxid on the velocity of catalytic hydrogenation. The subject is of importance on account of the presence of a small amount of carbon monoxid in hydrogen prepared commercially from water gas. Carefully neutralized olive oil was hydrogenated with mixtures of the purest electrolytic hydrogen and varying amounts of carbon

monoxid in the presence of finely divided nickel. The apparatus used has been found by the author to be very useful for the quantitative study of catalytic hydrogenation, and is described in detail.

It was found that carbon monoxid exerted a very marked poisonous effect other than the purely obstructive or diluting action of any foreign gas. The first traces of carbon monoxid had relatively the greatest retarding influence on the velocity of hydrogenation.

The fats and fatty acids of the grain sorghums, C. K. FRANCIS and W. G. FRIEDEMANN (*Oklahoma Sta. Bul. 117* (*1917*), *pp. 3–14*, *fig. 1*).—Continuing the study of grain sorghums previously noted (E. S. R., 35, p. 108), this bulletin records a detailed chemical analysis of the fats and fatty acids of the sorghums, Kafir corn, feterita, and milo maize. The experimental methods, where differing from those of the Association of Official Agricultural Chemists, are given in detail.

As large quantities of the crude fat were necessary for investigation, special apparatus was designed to permit a large amount of the raw material to be treated at one time. Four kg. of finely ground grain was put in an 8-liter aspirator bottle and covered with 1,600 cc. of ether. The bottle was shaken at intervals for 24 hours, then inverted, and the ether removed by percolation. The process was repeated seven or eight times until the extract was colorless. The percentage of fat obtained agreed closely with that obtained by the official (indirect) method.

The fat extracted from milo maize is a liquid at ordinary temperatures, containing a small amount of solid fat; that of Kafir corn and feterita a greenish vaseline-like substance. The physical and chemical constants of the fat from the three varieties showed a marked similarity.

The analysis showed six fatty acids to be present in similar proportions in the three sorghums. The volatile acids varied from 0.59 to 0.85 per cent of the fats. Formic and butyric acids were found in all three and some of the higher volatile acids in Kafir corn fat. From 7 to 10 per cent of the fat consisted of a mixture of palmitic and stearic acids, with traces of higher saturated acids in Kafir corn and milo maize fat. Stearic acid predominated in Kafir corn and feterita fat, and palmitic in milo maize fat. From 80 to 86 per cent of the fat consisted of the unsaturated acids, oleic and linoleic.

The analysis offers additional evidence of the close relationship of the plants under investigation.

The seeds of the Echinocystis oregana, M. R. DAUGHTERS (*Jour. Indus. and Engin. Chem.*, *10* (*1918*), *No. 2*, *pp. 126*, *127*).—This article reports the results of studies to determine the possible industrial value of the seeds of *E. oregana*, or wild cucumber, which grows very abundantly along the Pacific slope from British Columbia to California. Tables are given of the percentage composition of the seeds and the constants of the oil obtained by extraction with petroleum ether and by expression in the cold from the ground whole seed.

The constants of the oil indicated that it belongs to the cottonseed group. The taste is similar to olive oil. When subjected to hydrogenation, a bland yellowish-white fat was produced, with a melting point of 29 to 36° C., a solidifying temperature of 25°, and an iodin number of 76.6. Feeding experiments with mice showed both the original oil and the hydrogenated fat to be nonpoisonous.

Analytical examination of acorns and horse chestnuts, J. L. BAKER and H. F. E. HULTON (*Analyst*, *42* (*1917*), *No 500*, *pp. 351–355*).—Analyses of four samples of horse chestnuts and two of acorns, with particular reference to carbohydrate content, are reported.

It was found that the chestnuts possess considerable diastatic activity. An examination of the diastase showed that it resembled that of an ungerminated cereal in its action. No evidence of a similar diastase in acorns could be obtained.

The possible utilization of chestnuts and acorns as a source of alcohol was studied. The ground nuts were boiled with 2 per cent sulphuric acid under a reflux condenser for three hours, filtered, and the filtrate neutralized. The solution of sugar was then fermented for three or four days with brewer's yeast. A yield of alcohol of 27 and 27.3 per cent for the dry peeled kernel and 11.6 and 11.5 per cent for nuts as picked was obtained from two samples of chestnuts. The corresponding yields for two samples of acorns were 26.1 and 27.5 per cent for dry-peeled kernel and 12 and 12.7 per cent for nuts as picked. This is equivalent to a yield of from 32 to 36 gal. of absolute alcohol per ton of the nuts as picked.

Division of chemistry, annual report, 1915–16, B. DE C. MARCHAND (*Union So. Africa Dept. Agr. Rpt. 1916, pp. 105–108*).—This includes analyses of soils, manures and other fertilizers, feeding stuffs, and brine salts.

A simple and efficient filtering tube, W. M. THORNTON, JR. (*Jour. Indus. and Engin. Chem., 10 (1918), No. 2, p. 132, fig. 1*).—The author describes a simple device for filtering with the least possible volume of the liquid used for transferring and washing the precipitate. Filtration may be very quickly performed, thus reducing the losses incurred in handling precipitates which increase in solubility on rise of temperature.

The utilization of the adsorptive power of fuller's earth for chemical separations, A. SEIDELL (*Jour. Amer. Chem. Soc., 40 (1918), No. 1, pp. 312–328, figs. 2*).—In view of the practical application of the utilization of fuller's earth in the separation of alkaloids from plants and "vitamins" from mixtures in which they occur (E. S. R., 35, p. 472), the author has conducted a series of investigations on the adsorptive power of fuller's earth from different sources and the effects on the adsorptive process of such factors as time, agitation, dilution, presence of other dissolved substances, etc. Methods of procedure and analytical data in the form of tables and charts are given. The materials used for adsorption were quinin bisulphate and methylene blue.

A comparison of the adsorptive capacities of 36 samples of fuller's earths and other clays showed that English earth is superior to any of the domestic fuller's earths except one, the exact source of which could not be learned. Bentonite, which has a greater adsorptive power than the English fuller's earths, can not be used to advantage on account of its unusual capacity for retaining water. From the experimental data the author concludes that "the adsorptive power of fuller's earth is exerted particularly toward certain compounds, characterized by distinct basicity, and that in the case of salts only the base unites with the fuller's earth. No marked selectivity was found in the case of the two compounds forming the basis of the present experiments. The amount adsorbed in a given time is a function of ratio of earth to adsorbable material and, except with insufficient earth for complete adsorption, is independent of dilution, acidity, or presence of nonadsorbable neutral material."

Treatment of corks used in Soxhlet and other extraction apparatus, T. J. WARD (*Analyst, 42 (1917), No. 499, pp. 326, 327*).—A method is described for treating corks to be used in Soxhlet and other extraction apparatus to overcome errors arising from the porosity of cork and the solubility of certain constituents of the cork in the extraction solvent. The corks are heated for two hours on a boiling water bath in a solution of gelatin (previously soaked in cold water for five or six hours and then melted) in one-quarter volume of

glycerol and two volumes of water. They are then removed, dried, and used in a Soxhlet apparatus for an hour. Thus treated they may be used to advantage with any solvent in the vapor of which water and glycerol are not readily soluble. They should be stored at ordinary temperature, as a warm dry atmosphere causes them to shrink and harden.

The preparation of 1/100-normal permanganate solutions, J. O. Halverson and O. Bergeim (*Jour. Indus. and Engin. Chem., 10* (*1918*), *No. 2, pp. 119, 120*).—New technique for the preparation of $\frac{1}{100}$-normal solutions of potassium permanganate is described and a table given of the keeping qualities of dilute permanganates and of oxalic acid solutions used as standards.

A proximate quantitative method for the determination of rubidium and cæsium in plant ash, W. O. Robinson (*Jour. Indus. and Engin. Chem., 10* (*1918*), *No. 1, pp. 50, 51*).—This method is based on the removal of a large part of the potassium chlorid by fractional precipitation with platinic chlorid and, further, by strong hydrochloric acid. The resulting solution is compared spectroscopically with a standard solution.

The method is as follows: Twenty or more gm. of the dry plant are ashed in a muffle below 525° C. The ash is dissolved in hydrochloric acid, the excess evaporated, freshly slaked lime added, and the mixture boiled and filtered. The calcium is precipitated with ammonia and ammonium carbonate, the combined filtrates evaporated to dryness, and ammonium salts expelled. The alkali chlorids are filtered off with hot water, a few drops of hydrochloric acid added, and then about 0.05 gm. of platinic chlorid. The solution is evaporated to pastiness, a small amount of hot water added to dissolve the unchanged chlorids of potassium and sodium, and the chlorplatinates of the rare metals are washed on to the asbestos pad in a small carbon filter with 80 per cent alcohol. The filter is then connected to a hydrogen generator and the platinic chlorids reduced by heating with a Bunsen burner. The chlorids are washed through the filter with hot water, the filtrate evaporated to pastiness, and the mass taken up by a few drops of hydrochloric acid, filtered into tiny vials, and made up to volume. Standards are made with known amounts of cæsium and rubidium chlorids and an excess of potassium chlorid. The comparison is made by introducing a coil of platinum wire of sufficient size to withdraw a large drop. The coil is carefully dried and the unknown solution matched with a standard by means of the brilliancy of the hue.

Method for the determination of the amount of sugar in baked articles (*Analyst, 42* (*1917*), *No. 498, pp. 294, 295*).—This is the official method proposed by the Government Laboratory (England) for the determination of the amount of sugar present in baked articles examined under the Cake and Pastry Order. The preparation of samples and the methods of analysis are given in detail. If necessary to use a clearing agent, basic lead acetate followed by sodium sulphate, or alumina cream, or copper sulphate solution may be employed. The sugar is inverted with hydrochloric acid and the reducing sugar determined either by gravimetric or volumetric process and calculated as cane sugar. If the article contains fruit, the fruit is removed and analyzed separately for its sugar content.

A deduction of 3 per cent is made for sugars naturally present in flour or derived from flour in the course of baking, and an allowance of 2 per cent is made to provide for variations in sampling, in methods of analysis, and in the amount of sugar in the different materials employed.

Detection of alum in flour, L. Medri (*Staz. Sper. Agr. Ital., 49* (*1916*), *No. 11, pp. 597–601*).—A delicate method for detecting alum in flour is described. The principle involved is the formation of an insoluble color lake with cochineal

or alizarin. To 50 cc. water extract of the flour, 2 cc. of an alcoholic solution of the dye is added, and the solution heated to boiling. If the flour is pure, a white or cream-colored coagulum is formed from the soluble protein. The presence of alum causes the formation of the color lake characteristic of the dye used.

Tables are given showing the characteristic colors with cochineal and alizarin in the presence of different percentages of alum and also of zinc, copper, and lead.

Research on the detection of added water in milk, H. Durand and R. Stevenson (*Jour. Indus. and Engin. Chem., 10* (*1918*), *No. 1, pp. 26–30, fig. 1*).—This is a report of new methods for the detection of added water in milk proposed in an earlier article (E. S. R., 36, p. 807). The first two methods were based on the theory that water would increase the solubility of organic salts in the serum of milk. In one case lead subacetate was used and in the second silver nitrate. Both methods proved unreliable. The third method, the determination by the electrical conductivity method of Kohlrausch of the whole milk and of the serum after coagulation with electrolytes and nonelectrolytes, was tried out in an elaborate series of experiments but with no uniformity of results.

One of the authors proposes to continue the research, making use of the osmotic pressure of milk in a cell constructed to measure the differential osmotic pressure between milk and a standard saline solution.

The differentiation of coconut oil and palm-kernel oil in mixtures, G. D. Elsdon (*Analyst, 42* (*1917*), *No. 498, pp. 298–300*).—The author states that it is possible to distinguish between coconut and palm-kernel oils in mixtures of various fats, such as margarin, by obtaining both the Polenske and Shrewsbury-Knapp values and assuming the presence of palm-kernel oil in those cases in which the percentage of coconut oil calculated from the Polenske figure is less than that from the Shrewsbury-Knapp figure. This may, however, indicate the presence of coconut stearin which has practically the same composition as palm-kernel oil. He emphasizes the importance of the Shrewsbury-Knapp process in preventing incorrect conclusions being drawn from the Polenske process.

A combined Reichert-Polenske and modified Shrewsbury-Knapp process, G. D. Elsdon (*Analyst, 42* (*1917*), *No. 498, pp. 295–298, fig. 1*).—This article gives the results of a combination of the modified Shrewsbury-Knapp process previously noted (E. S. R., 37, p. 618) with the Reichert-Polenske process for the estimation of coconut oil in mixtures. The process is carried out as follows:

The flask containing the residual acids after the distillation of 110 cc. in the Reichert-Polenske method is cooled in water until the acids have become a solid cake. The cake is broken and the liquid strained through a fine wire sieve. The fatty acids are washed with 50 cc. of cold water, drained, returned to the flask, and dried in the oven. One hundred cc. of alcohol (sp. gr. 0.9200 at 60° F.) is then added and the process continued as given in the previous paper.

The method is much more rapid than the Shrewsbury-Knapp process. The results of analyses of various mixtures of coconut oil with butter and with margarin are given in tabular form and also in the form of curves from which the percentage of coconut oil in a given mixture may be read off. In using this combined process on butters, high figures for alcohol-soluble acids are invariably found in conjunction with high Reichert values. Consequently a high alcohol-soluble acid figure with a low Reichert value would indicate the presence of coconut oil while neither the Reichert nor the Polenske number alone would cause suspicion.

Variation in the ether extract of silage, L. D. Haigh (*Jour. Indus. and Engin. Chem., 10* (*1918*), *No. 2, p. 127*).—Analyses are reported showing the

variation in the composition of the ether extract of silage, depending upon changes in the sample itself on standing and upon the drying operations employed. Further studies are being made to ascertain the causes of such variation.

A constant temperature and humidity room for the testing of paper, textiles, etc., F. P. Veitch and E. O. Reed (*Jour. Indus. and Engin. Chem., 10 (1918), No. 1, pp. 38–44, figs. 6*).—This article describes the specially constructed and automatically controlled constant-temperature and humidity room at the Bureau of Chemistry, U. S. Department of Agriculture. The room is used in the testing of paper, but it is pointed out that the control of humidity is of importance in many industrial lines, and is being applied to the ripening of fruit, curing of cheese, drying of lumber, etc.

A method for determining the absorbency of paper, E. O. Reed (*Jour. Indus. and Engin. Chem., 10 (1918), No. 1, pp. 44–47*).

The cost of producing maple products in 1912 and 1913, C. J. Frink (*Vermont Sta. Bul. 203 (1917), pp. 17–24, figs. 3*).—The author has collected from a number of sugar producers in Vermont data concerning the cost of production of maple products and prices received for the same during the seasons of 1912 and 1913 and has arranged the data in the form of tables and graphs.

The relation between total cost per pound and production per bucket is considered significant. A decrease in the cost per pound coincides with increased yield per bucket. The graph of this relationship gives a general idea of the probable cost of a pound of sugar for any given average bucket production. A 1-lb. per bucket yield showed a manufacturing cost of 11 cts. for 1 lb. of sugar while a 3-lb. per bucket yield reduced the cost to 7.5 cts. per pound.

Vinegar from waste fruits, W. V. Cruess (*California Sta. Bul. 287 (1917), pp. 169–184, figs. 11*).—This bulletin describes the necessary apparatus and procedures for the alcoholic fermentation, acetic acid fermentation, and clarification and filtration of the product in the conversion of waste fruit juices into vinegar. Brief notes on vinegar diseases are included.

The canning industry.—Some accomplishments and opportunities along technical lines, H. A. Baker (*Jour. Indus. and Engin. Chem., 10 (1918), No. 1, pp. 69–71*).—This includes a brief history of the canning industry in the United States, an outline of some of the problems confronting the industry and their solution, and suggestions as to further possibilities of conservation by the discovery of methods of utilizing waste products. The importance of chemists in the industry is emphasized.

METEOROLOGY.

Climatic control of cropping systems and farm operations, J. F. Voorhees (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 2, pp. 127–132*).—The author maintains on the basis of his study of conditions in Tennessee that all successful cropping systems must be so planned that they make use of all favorable climatic conditions. "To do this to the best advantage the time required for each crop to mature under any given conditions must be known. The effect of variations in heat intensity upon the various stages of the life history of insect pests should also be known." The discussion is confined "to the broad and comparatively unchanging features of climate and disregards the more changeable features of weather . . . [such as] the average conditions of temperature, rainfall, and growing season at a given place for a long period of years." These are considered with reference to continuous cropping, two-crop, and one-crop systems of farming.

A marked correlation between intensity of temperature and time required for crops to mature was shown in studies carried on by the author in coopera-

tion with the Tennessee Experiment Station and certain stations of the Weather Bureau of the U. S. Department of Agriculture with soy beans and corn extending over eight years and covering "a territory extending from the Gulf to the Great Lakes and from the Atlantic to the Rocky Mountains. Records were kept of dates of planting, emergence, blooming, and ripening, together with the daily maximum and minimum temperatures and rainfall.

"It was found that between plantings made at the same date, but at places having different temperature conditions, there was a wide difference in the length of time required for the different stages of growth. A similar difference was found between plantings made at different dates at the same place. These variations were always in the same direction, but different in amount. It appeared that the higher the mean temperature the shorter the time required for the plant to reach a certain stage."

With the Mammoth Yellow soy bean, for example, the period from planting to blooming was found to vary from 42 to 133 days. The correlation between mean temperature and length of time from planting to blooming with 50 plants of this variety was −0.76 with a probable error of ±0.05. The correlation "between mean temperature and the length of the period from emergence to blooming of Indian corn at Wauseon, Ohio, gives a coefficient of −0.79, ±0.05."

A similar study of the correlation of heat intensity and the length of the incubation period of the cattle tick (*Margaropus annulatus*) at Dallas, Tex., gave a coefficient of −0.93 with a probable error of ±0.013.

These results indicate that heat intensity is an important factor in determining the time required by the plant to make its growth and that the period of incubation of the cattle tick "is controlled almost entirely by heat intensity. The temperature control of the length of the seed-tick stage is almost as great."

A plea is made for cooperative work along these lines.

Climatic records in the trunks of trees, A. E. DOUGLASS (*Amer. Forestry, 23 (1917), No. 288, pp. 732–735, figs. 3*).—The studies of tree rings briefly reported in this article are thought to indicate a relationship between tree growth, rainfall, and sun spot numbers.

The pleionian cycle of climatic fluctuations, H. ÅRCTOWSKI (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 2, pp. 172–179; Sci. Amer. Sup., 85 (1918), No. 2196, pp. 66, 67*).—This article deals with studies the essential features of which have already been noted from other sources (E. S. R., 31, p. 717; 32, p. 509).

A preliminary note on soil moisture and temperature factors in the winterkilling of grain crops, S. C. SALMON (*Science, n. ser., 47 (1918), No. 1207, pp. 173, 174*).—Briefly describing and summarizing the results of a general study at the Kansas Experiment Station of the causes of winterkilling of cereals, it is stated that "the preliminary work indicates that a sandy soil is colder and the survival of plants growing upon it less than on a dry clay or loam soil, and also colder than a wet clay or a wet loam during those seasons when the ground remains unfrozen much of the time. It appears probable that dry sand is colder during the winter than a wet sand regardless of the character of the season, but a dry clay or silt loam is colder than a wet soil of the same kind only when the ground remains unfrozen."

Tropical rains: Their duration, frequency, and intensity, O. L. FASSIG (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 2, pp. 460–473, figs. 16*).—This study has already been noted from another source (E. S. R., 35, p. 619).

Frost in the United States, W. G. REED (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 2, pp. 593–631, figs. 13*).—Frost data for selected stations in the United

States are tabulated and discussed, and maps are presented which show (1) the average dates of the last killing frost in the spring and the first in the fall in the United States, (2) the average frostless period, (3) the probable occurrence of the last killing frost in spring and the first killing frost in the fall in one year in ten, and (4) the probable length of the season without killing frost in four years out of five. The business risk involved in planting and harvesting at particular times is discussed.

Snow surveying: Its problems and their present phases with reference to Mount Rose, Nevada, and vicinity, J. E. Church, jr. (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 2, pp. 496–549, pl. 1, figs. 3*).—The methods and apparatus used by the author in measuring snow and the evaporation from snow fields are described in detail, and the application of the results in forecasting the probable water supply for irrigation is fully discussed. Special attention is given to methods of forecasting, based on seasonal percentage surveys, in which the object is to determine the percentage relationship of a given season's snowfall to that which normally occurs in a watershed applying "the resulting percentage to the normal run-off as measured at the outlet of the basin."

These studies have been noted from time to time from other sources (E. S. R., 36, p. 17; 37, p. 16).

Snow and its value to the farmer, A. H. Palmer (*Sci. Mo., 6 (1918), No. 2, pp. 128–141, figs. 18*).—It is pointed out in this article that, "as a blanket or covering, snow on the ground checks winterkilling. It protects vegetation from extreme temperatures, from excessive evaporation, and from destructive winds, at the same time permitting the penetration of some sunlight and allowing uninterrupted respiration of plant tissue. On twigs and buds it conserves cellular moisture which otherwise might be sacrificed at too rapid a rate during sudden changes of temperature. It mellows the soil, replenishes the ground moisture, checks the run-off from winter rains, furnishes most of the water used for irrigation and power purposes, provides an easy means of transportation, and prevents destructive prairie and forest fires. Grass is benefitted by abundant snows, and winter wheat is largely dependent upon it for its success."

Nitrogen, chlorin, and sulphates in rain and snow, E. L. Peck (*Chem. News, 116 (1917), No. 3029, pp. 283, 284*).—The data contained in a continuation from October 20, 1916, to June 8, 1917, of studies on this subject at Cornell College, Iowa, are reported in detail (E. S. R., 34, p. 615).

Weather review for 1914 and 1915, W. M. Esten (*Connecticut Storrs Sta. Rpt. 1914–15, pp. 255–270, fig. 1*).—Observations at Storrs, Conn., on temperature, precipitation, and length of the growing season are summarized and tables are given which show the monthly and annual means of temperature and precipitation, 1888 to 1914, and length of the growing season, 1888 to 1915.

The mean temperature for 28 years, 1888 to 1915, was 47.47° F.; highest temperature, 99°, July 3, 1912; lowest temperature, —17°, February 14, 1914; mean rainfall, 44.17 in.; longest duration of growing season 184 days, April 18 to October 19, 1901; average date of last killing frost in spring, May 3; average date of first killing frost in autumn, October 10; and prevailing wind in January, February, March, April, May, August, October, November, and December, northwest; in June, July, and September, southwest; and for the year, northwest.

Annual report of Iowa weather and crop bureau for 1916, G. M. Chappel (*Iowa Yearbook Agr., 17 (1916), pp. 514–573, 579–582, figs. 9*).—This report is made up of the summaries of the monthly and weekly bulletins issued by the Iowa Weather and Crop Service in cooperation with the Weather Bureau of the U. S. Department of Agriculture.

Meteorological review, C. FLAMMARION (*Ann. Astron. et Mét.* [*Paris*], *54* (*1918*), *pp. 299–343, figs. 16*).—The conditions of atmospheric pressure, temperature of the air and soil, rainfall, cloudiness, etc., with special reference to the region of Juvisy and the environs of Paris are summarized. The article also contains special notes on the unusually severe winter of 1916–17, extreme variations of temperature in 1916 and 1917, the clear night of December 23, 1916, remarkable solar halos, and a marine tornado.

SOILS—FERTILIZERS.

Movement of soluble salts through soils, M. M. McCOOL and L. C. WHEETING (*U. S. Dept. Agr., Jour. Agr. Research, 11* (*1917*), *No. 11, pp. 531–547, figs. 5*).—Results are reported of laboratory studies at the Michigan Experiment Station of the translocation of certain salts (including sodium chlorid, potassium chlorid, and sodium carbonate) when added in varying amounts to soils of different texture (heavy and light silt loam, and medium and fine quartz sand) and moisture contents, as well as of changes induced in the composition of the soil solution. The experiments were made in sealed and unsealed containers, maintained in both a horizontal and upright position, known amounts of the different salts being introduced into the center of the soil mass. A study of changes in the concentration of the soil solutions was made by determinations of freezing-point lowerings at various distances from the salt layer and at different intervals of time. In addition, chemical studies were made of the soil solutions obtained by extracting one part of the different layers of soil with one of distilled water, passing the extract through Chamberland filters and determining the amount of certain bases (iron and aluminum, calcium, and magnesium) found therein. The data are presented in tabular form and the results illustrated by graphs.

The authors conclude that the data presented show that soluble salts are translocated from regions of high to those of lower concentration in moist soils when inclosed in sealed containers; and in case of silt loam in the open containers upward movement is very rapid and the downward translocation is marked, the water movement evidently decreasing the downward translocation. . . . In case of the potassium chlorid, the lack of movement reported may have been and probably was due to the retention of the potassium by the soil, other bases being forced into the solution. . . . Such movements are to be expected, especially if the moisture coats the soil particles in the form of films, in view of the fact that diffusion of salts takes place in solution, but on the other hand the movement may not be and probably is not due wholly to diffusion. It does not seem untenable to assume that the reactions which take place when salts are added to the soil play their rôle. A given base coming in contact with a particle or a group of particles may be held and others liberated, adjacent particles may not be satisfied, so far as one or more of these bases are concerned, and by removing them from solution may aid in the translocation of soluble material in the soil.

"The chemical studies show that the addition of soluble salts to a given region of the soil results in changes of the composition of the soil solution which may not be confined to the soil mass receiving the application. It seems that such conditions are of far-reaching importance in connection with the results obtained from the use of soluble-fertilizer salts, as well as attempts to bring about a so-called balanced soil solution. Inasmuch as soils undoubtedly vary with respect to the action that takes place when they are treated with various soluble substances, it does not seem possible to work out a balanced soil solution by studying a few soils."

Finally, it is concluded that "soluble salts . . . do not long remain localized, as reported by earlier investigators. Moreover, the rate of movement is affected by the water content of the soil and the mass of salt present. Where moisture is being lost by evaporation, the upward movement is more rapid than the downward translocation in heavier soils; but in case of sands the downward translocation is indeed slight, thus indicating that soluble salts, such as sodium nitrate, are more likely to be lost by upward movement to the surface of sandy soils during a drought than in case of heavier soils. . . .

"The indications are that the translocation of soluble salts in soils is brought about by means of diffusion, by reactions that take place in the soil, and by moisture movements. Field and laboratory experiments in progress should throw additional light upon moisture movement in different soil classes, as well as the upward movement from the subsoil of substances in solution."

Excess soluble salts in humid soils, S. D. CONNER (*Jour. Amer. Soc. Agron., 9 (1917), No. 6, pp. 297–301*).—Experiments conducted at the Indiana Experiment Station are reported, the results of which are taken to indicate that "black soils in humid regions sometimes contain excessive amounts of soluble salts. These soluble salts may cause injury to crops, due to high concentration of nontoxic salts, to a lower concentration of more toxic substances, or to a combination of both. The salts occurring in high concentration are generally nitrates. The toxic salts occur generally in acid soils and are mainly soluble salts of aluminum. The only clay and loam soils that were found to contain excessive soluble salts were of artificial origin, such as spots where old stables had stood."

Lysimeter investigations, H. K. DEAN (*U. S. Dept. Agr., Bur. Plant Indust., Work Umatilla Expt. Farm, 1915–16, pp. 14–16*).—Loss of moisture from cropped and uncropped sandy soils of the Umatilla project in Oregon in 1915 (May 22 to the end of the year) and 1916, through percolation and evaporation and transpiration, as determined with concrete lysimeters 3.3 ft. square by 6 ft. deep, was as follows:

Percolation and evaporation and transpiration (in acre-inches) from lysimeters.

Lysimeter.	Crop.	Water supplied by precipitation and irrigation.		Percolation.				Evaporation and transpiration.			
		1915.	1916.	1915.	1916.	1915.	1916.	1915.	1916.	1915.	1916.
		Inches.	*Inches.*	*Inches.*	*Inches.*	*Per cent.*	*Per cent.*	*Inches.*	*Inches.*	*Per cent.*	*Per cent.*
No. 1..	No crop......	38.75	56.87	26.041	44.565	67.2	78.3	12.709	12.305	32.8	21.7
No. 2..	Soy beans and hairy vetch......	38.75	56.87	19.470	27.219	50.2	47.8	19.280	29.651	49.8	52.2
No. 3..	Alfalfa........	38.75	56.87	13.245	12.400	34.4	21.8	25.505	44.470	65.6	78.2
No. 4..	Alfalfa (manured).....	38.75	56.87	13.438	12.062	34.7	21.2	25.312	44.808	65.3	78.8

During 1916 both the irrigation water and the percolate were tested and found to contain calcium, carbonates, bicarbonates, chlorin, sulphates, and nitrates. Less of the bicarbonates, chlorids, and sulphates and more calcium, carbonates, and nitrates were found in the percolate than were added in the irrigation water. The greatest amount of nitrates was obtained from the lysimeter growing soy beans and vetch, with the uncropped lysimeter second. Comparatively little nitrate was lost from the lysimeters with alfalfa.

Evaporation from the uncropped lysimeter averaged 0.677 acre-inch per one-week period in 1915 and 0.583 acre-inch in 1916, as compared with an evaporation of 1.811 and 1.403 in. from a free water surface for the same periods. The evaporation and transpiration from the lysimeter with soy beans averaged 0.986 acre-inch per week in 1915 and with soy beans and vetch 1.307 in. in 1916. The evaporation and transpiration of the two alfalfa lysimeters averaged 1.323 acre-inches per week in 1915 and were comparatively constant. In 1916 there was considerable variation, depending upon the amount of water applied, amounting to 1.509 acre-inches per week with 1.5 acre-inch irrigations, 1.672 acre-inches with 2 acre-inch irrigations, and 2.57 acre-inches with 3 acre-inch irrigations. The variations are thought to be due to the fact that the crop received rather less moisture than was required for maximum growth with the 1.5 and 2 acre-inch applications, but an amount greater than the actual needs of the crop with the 3 acre-inch applications.

Experiments in methods for determining the reaction of soils, H. R. Christensen (*Soil Sci., 4 (1917), No. 2, pp. 115–178, figs. 4*).—The results of experiments reported in this article indicate the necessity of distinguishing sharply between the absolute acidity of the soil and its ability to free acids.

"The majority of methods suggested for making a quantitative determination of the acidity of the soil give no information as to the content of truly acid-reacting substances in the soil, but only of its ability to absorb bases, which is partly determined by the presence of acid-reacting substances and partly by the presence of nonbase saturate colloids, or other nonacid-reacting but base-absorbing substances. . . . In determining the ability of the soil to absorb bases, a method based on Baumann and Gully's principles, in which acetates are employed, should be preferred."

It is thought probable that free acids exist in sphagnum peat, and the results of the investigations are taken to indicate that the ability of this type of soil to absorb bases is partly dependent on the presence of acid-reacting substances. It is further thought that the ability of a soil to color a neutral litmus solution red is an indication of the presence of free acids.

"A determination of the base-absorption power of the soil is not sufficient for determining its lime requirement, for it has been found that many soils which were considered to require lime (such as those not causing Azotobacter vegetation under the Azotobacter test) possess less power to free acids in a calcium acetate solution than those which do not require lime (such as those causing Azotobacter vegetation under the Azotobacter test). . . . The qualitative determination of the lime requirement, according to the combined litmus and Azotobacter tests, can to a certain extent give information as to the degree of the lime requirement of the soil. . . .

"It is probable that the question of the lime requirement of the soil is predominantly a question of the presence or absence of certain easily decomposed acid-saturating calcium (or magnesium) compounds."

The nitrogen-fixing bacteria in water and the soil beneath the water, H. Fischer (*Centbl., Bakt.* [*etc.*], *2. Abt., 46 (1916), No. 11–16, pp. 304–328; abs. in Chem. Zentbl., 1916, II, pp. 764, 765; Chem. Abs., 11 (1917), No. 15, p. 2251; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 1, pp. 26, 27*).—Experiments are reported in which it was found that soil before the construction of a farm pond contained large numbers of Azotobacter while two years after the pond was built very few Azotobacter were found and in 1915 they were almost completely gone. Attempts to grow the organism in symbiosis with water plants were unsuccessful. It is concluded that Azotobacter plays no important rôle in such ponds.

"Of special significance for the fixation of nitrogen in water is the parasitism or symbiosis between green water plants, especially algæ, and short bacilli of the pneumonia group. Their action is not increased by sodium nitrate or artificial fertilization. In Wielenbach it was found that by nitrogen-free fertilizer, with the help of these nitrogen-fixing bacteria, a multitudinous increase of fish was produced. The action of the nitrogen-fixing bacteria shows itself further in a tenfold enrichment of the ground at the bottom of the pond. The significance of free living nitrogen-fixing bacteria, especially the aerobacterial and radiobacterial forms, can be favorably compared with that of the nodule bacilli for the legumes."

Microorganisms of waste and cultivated peat soils, T. Arnd (*Centbl. Bakt. [etc.], 2. Abt., 45 (1916), No. 8–25, pp. 554–574; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 12, pp. 1744, 1745; Jour. Soc. Chem. Indus., 36 (1917), No. 15, p. 897*).—Preliminary trials at the Bremen Experiment Station to ascertain the effect of drainage, liming, and tillage on the bacterial life of peat soils, gave the following general results:

Ammonifying organisms were present in all samples but were far more active in surface soils than in subsoils and in cultivated than in waste land. The breaking up of waste land affected the bacterial life only to a depth of about 8 in. of soil. No nitrifying organisms were found in waste land or cultivated land, except such as received a dressing of more than 0.5 ton of lime per acre. More than 1 ton per acre appeared to be necessary to produce active development of the nitrifying organisms in the peat itself. All the samples tested were able to reduce nitrates. The surface soil of waste land was not much more active than the subsoil, but the surface soil of cultivated land showed much more activity, especially where tillage had been accompanied by liming. Similar relations were observed in respect to the power of decomposing cellulose. As with ammonification and nitrification, the maximum decomposition of cellulose occurred when the soil had previously received a dressing of dung. In no sample of soil was Azotobacter present. Surface soils and cultivated soils fermented mannitol more readily than subsoils and waste land, the maximum effect again being obtained with a manured plat.

Soil sterilization, F. O. Ockerblad, jr. (*Vermont Sta. Bul. 203 (1917), pp. 14–16*).—Studies with greenhouse soil containing approximately 3,250,000 organisms per cubic centimeter are briefly noted, in which steam, phenol, sulphuric acid, formaldehyde, carbon disulphid, and pyridin were employed. The steaming was done in an autoclave for 1, 2, and 5 hours and for half-hour intervals on three successive days, the soil being placed in glass tubes 1 in. wide and 12 in. long and in 8 in. flower pots.

The surface soil exhibited little difference for the several treatments, over 99 per cent of the organisms being killed, while at a depth of 30 cm. (about 1 ft.) wide differences occurred. The 5-hour treatment proved most effective at all depths. The relatively high percentage of organisms killed at depths of 20 and 30 cm. is thought to be due to the penetration of the dry heat through the walls of the glass tube, and that equally good results would be obtained in actual practice is deemed unlikely. The percentage of organisms killed in the pots appeared to be fairly uniform throughout the soil column. Oats grown in pots of steamed and unsteamed soil produced approximately one-seventh more dry matter on the treated soil.

The chemicals were used in solutions of 0.1, 0.5, and 1 per cent, except formaldehyde which was used in 0.4, 0.8, and 1.2 per cent solutions, and were applied to greenhouse beds 5 in. deep, the plats being covered for one and two days. Phenol and carbon disulphid were generally ineffective; pyridin

was somewhat effective at 0.1 per cent strength; and sulphuric acid was fairly effective, a one-day exposure accounting for from 91.3 to 96.7 per cent of the organisms, two-day exposures for from 68.3 to 86.9 per cent. Formaldehyde proved to be most effective, having killed more than 99 per cent of the organisms in four of six trials and 97.2 per cent in a fifth trial. "The gas seems to combine with, or in some way to affect, the albuminous contents of the bacterial cell, thus inhibiting reproduction."

Steam is considered more effective than any chemical, but proved to be cumbersome to use and of limited range. Formaldehyde was estimated to have cost about 1.5 cts. per square yard of application.

Samples of soil taken from plats which had received air-slaked lime, quicklime, and chlorid of lime at the rate of 150 bu. per acre, and representing depths near the surface, from 3 to 6 in., and from 6 to 9 in., showed from 36 to 60 per cent less organisms for the surface of the limed plats than for untreated check plats, but increases in the bacterial population for the other depths ranging from 51 to 498 per cent.

Researches on the equilibrium between the nitrogen and carbon in the soil, P. FELBER (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien, 3 (1916), No. 1, pp. 23–54; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 1, pp. 22–25; Abs. Bact., 1 (1917), No. 4, p. 308*).—Analysis of a variety of soils indicated that the carbon-nitrogen relations are fairly constant.

The influence of bacterial activity as indicated by the carbon-nitrogen ratio upon these soils with and without the addition of various substances was determined. In the control test the bacterial activity caused a loss in both organic matter and nitrogen. A similar loss occurred with soy-bean meal. With straw the loss in nitrogen was less. The addition of lime intensified the decomposition of organic matter but did not influence the loss in ammonia. Nitrification, denitrification, and nitrogen fixation were not affected by the lime. The digestion of earth with water at 30° C. for three days showed that the ratio between carbon and nitrogen was altered, there being an increased proportion of nitrogen. Denitrification of saltpeter occurred when it was added in combination with straw meal or dextrose. Without these sources of carbon there was an elimination of carbon but the saltpeter was not destroyed.

The humus content of the soil, H. J. WHEELER (*Proc. Amer. Assoc. Farmers' Inst. Workers, 21 (1916), pp. 79–90, figs. 2*).—This is a lecture dealing with humus, its origin, production, and activity in soil with special reference to its relation to the fertility of different soil types.

Soil survey of the Riverside area, Cal., J. W. NELSON, R. L. PENDLETON, J. E. DUNN, A. T. STRAHORN, and E. B. WATSON (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1915, pp. 5–88, pls. 4, fig. 1, map 1*).—This survey, made in cooperation with the California Experiment Station, deals with the soils of an area of 387,840 acres situated in the western part of Riverside County and the southwestern corner of San Bernardino County. Topographically, it consists mainly of a series of large alluvial fans extending from the surrounding mountains and merging into an extensive, gently sloping plain, while several low mountains occur within the area. As a whole the region is well drained, although local low-lying spots having a high-water table are affected with alkali.

The soils of the area are largely derived from granite, gneiss, and schists, and have been spread over the region as extensive alluvial-fan deposits. Thirty-five soil types representing 13 series are mapped, in addition to river-

wash, rough broken land, and rough stony land. Approximately 90 per cent of the soils are of a loam or lighter texture.

Soil survey of Bottineau County, N. Dak., W. B. COBB, W. I. WATKINS, A. T. STRAHORN, M. E. STEBBINS, M. THOMAS, and A. C. ANDERSON (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1915, pp. 5–54, fig. 1, map 1*).—This survey, made in cooperation with the North Dakota Experiment Station, deals with the soils of an area of 1,075,840 acres in north-central North Dakota. The county lies in the glaciated portion of the Great Plains, the topography varying from nearly level to gently undulating in the Prairie Plains region, to undulating to hilly in the Turtle Mountains region. The drainage system is far from complete but adequate to care for the run-off.

The chemical composition of the soils of the county was determined by numerous analyses of both surface and subsoil and is said to compare favorably with that of soils of rich agricultural regions. "Like many of the other soils of the Middle West they are lower in nitrogen and phosphorus than in the other important elements when measured on the basis of standard crop demands. They differ from the soils of the more humid regions in the Middle West in that they contain much larger amounts of calcium and magnesium. They also contain larger amounts of limestone or calcium carbonate. Owing to defective drainage, small areas contain considerable amounts of soluble salts."

The soils of the county are of glacial, or drift and alluvium origin. Eighteen soil types and 7 type phases of 8 series, exclusive of peat and muck, are mapped. Barnes loam, Barnes very fine sandy loam, and Barnes fine sandy loam predominate, occupying 32.5, 22, and 11.6 per cent of the total area, respectively.

Soil survey of San Saba County, Tex., J. O. VEATCH, R. F. ROGERS, M. W. BECK, and H. G. LEWIS (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 5–67, fig. 1, map 1*).—This survey deals with the soils of an area of 710,400 acres in central Texas lying in the High Plains region of the State, and physiographically is a maturely dissected plateau. The topography of the county varies from rolling or nearly level to deeply dissected, steep and precipitous, with a general elevation ranging from about 1,200 to 1,900 ft. above sea level.

The soils of the county are mainly residual in origin with about one-seventh of the area derived from alluvial deposits. "Clay and clay loam soils predominate, with fine sandy loam next in extent. The greater part of the upland is excessively stony and poorly adapted to farming. With the exception of some of the sandy types, the soils are prevailingly dark in color at the surface and moderately to highly calcareous. In addition to rough stony land, 34 soil types, one represented by a phase, are mapped. These are classed with 14 soil series."

Crawford stony clay, San Saba stony clay, and rough stony land constitute 15.5, 15.4, and 10.4 per cent of the area, respectively.

Erosion of Kansas soils, R. I. THROCKMORTON (*Bien. Rpt. Kans. Bd. Agr., 20 (1915–16), pp. 170–178, figs. 8*).—Erosion of Kansas soils and methods of prevention are discussed, including the terrace method and the earth dam method.

Soil improvement, R. W. ALLEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Umatilla Expt. Farm, 1915–16, pp. 8–12, figs. 2*).—The soil fertility problems on the Umatilla project near Hermiston, Oreg., are briefly stated, and yields of clover in 1912, 1915, and 1916, with applications of nitrate of soda, muriate of potash, phosphate rock, lime, tankage, blood meal, and stable manure are reported. The results are deemed inconclusive due to the uneven character of the land from grading for irrigation, but the greatest gain attributed to the fer-

tilizer treatments followed applications of 1,000 and 2,000 lbs. of tankage per acre.

Concerning farm manures, R. T. BURDICK (*Vermont Sta. Bul. 206 (1917), pp. 53–72*).—This article, dealing with farm manures, their chemical composition, physical characteristics, preservation, application, and use, under Vermont conditions, is a slightly more detailed account of the same subject previously noted (E. S. R., 16, p. 245).

The manufacture of commercial fertilizers, J. L. HILLS (*Vermont Sta. Bul. 207 (1917), pp. 48, pls. 8, fig. 1*).—This bulletin sets forth in a comprehensive manner the present status of fertilizer manufacturing in the North Atlantic States, embracing a discussion of the raw materials; manufacturing processes, including the manufacture of sulphuric acid and a description of the wet-, base-, and dry-mix processes; and manufacturing and selling costs.

Sterilized animal meal (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 4 (1916), pp. 137–141*).—The process of manufacture of so-called sterilized animal meal from the carcasses of dead animals is described.

"The special merits of sterilized animal meal are due to the fact that it is a concentrated organic manure containing high percentages of nitrogen and phosphoric acid, in various degrees of availability. . . . The best results are usually obtained when it is used on light well-drained soils, but it also does well on certain heavier soils."

The fixation of nitrogen, J. E. BUCHER (*Jour. Indus. and Engin. Chem., 9 (1917), No. 3, pp. 233–253, figs. 16; abs. in Metallurg. and Chem. Engin., 16 (1917), No. 6, pp. 315–317; Sci. Amer. Sup., 83 (1917), No. 2153, p. 215; Sci. Amer., 116 (1917), No. 15, p. 373; Metallurg. and Chem. Eng., 16 (1917), No. 2, p. 82; Amer. Jour. Sci., 4. ser., 43 (1917), No. 256, p. 329; Sci. Abs., Sect. B—Elect. Engin., 20 (1917), No. 235, pp. 231, 232; Engineering [London], 103 (1917), No. 2682, p. 505*).—In this paper it is stated that experiments showed that the necessity for electric power in nitrogen fixation may be done away with by using chemical means. The substance of the discovery is that nitrogen will combine with an alkali and carbon in the presence of iron as a catalyst producing cyanid. Soda ash and powdered iron or iron ore were mixed with powdered coke. "Upon heating this mixture in an ordinary furnace and running air over it, the result is cyanid of soda, leaving the iron uncombined. In spite of this fact, that the iron is in the end untouched by the action, if it be omitted no action takes place."

It was further found that letting waste carbon dioxid gas into the sodium cyanid solution resulted in the production of urea.

The synthesis of ammonia by the Haber process, R. O. E. DAVIS and H. BRYAN (*Amer. Fert., 47 (1917), No. 7, pp. 29, 30*).—This process is described.

Making available the organic nitrogen of leather, hair, wool waste, and muck or peat, R. E. ROSE (*Amer. Fert., 47 (1917), No. 7, pp. 24–26*).—This is a brief review and discussion of the subject presented in a paper before the fifty-fifth annual meeting of the American Chemical Society.

Solubility of mineral phosphates and superphosphates in dilute mineral and organic acids, A. AITA (*Ann. Chim. Appl. [Rome], 9 (1917), pp. 200–210; abs. in Jour. Soc. Chem. Indus., 36 (1917), No. 15, p. 897*).—In each determination 2.5 gm. of the phosphate was digested for 30 minutes at from 14 to 15° C. with 250 cc. of the dilute sulphuric, hydrochloric, formic, acetic, oxalic, tartaric, or citric acid solutions, the mixture being frequently stirred. The mineral acids were used in strengths of 0.01 to 0.1 gm. equivalent per liter and the organic acids in 0.25 or 1 gm. equivalent per liter.

It was found that in the case of the inorganic acids the solubility of the phosphoric anhydrid in superphosphate was comparable with that obtained with the mineral phosphates, after making allowances for such factors as fineness, friability, and proportion of lime. In the case of the organic acids, mineral phosphates behaved in the same way as when treated with inorganic acids, except that there was a slighter dissociation and that the influence of other constituents was more pronounced. Superphosphates, however, behaved in the same way as mineral phosphates toward oxalic acid, but yielded a high proportion of phosphoric anhydrid to the other solutions. For example, the following amounts of the total phosphoric anhydrid were extracted: With formic acid 73.28, acetic acid 62.61, oxalic acid 24.44, tartaric acid 66.43, and citric acid 77.87 per cent.

"The formation of complex citrophosphates in combination with aluminum and ferric iron has been shown [E. S. R., 36, p. 727] to be the cause of the high citric solubility of phosphoric acid, and it would seem that similar complex compounds are formed with organic acids containing atoms of hydrogen not in combination in carboxyl or hydroxyl groups. The solubility of the phosphoric anhydrid in superphosphates is somewhat less than that of mineral phosphates in dilute mineral acids, but the solubility of the phosphoric anhydrid is almost equal in both cases in organic acids which have the property of forming compounds with phosphoric acid, aluminum, and ferric iron."

Fertilizer trials with tetraphosphate in Piedmont rice fields, Italy, Marcarelli and Novelli (*Gior. Risicolt., 6 (1916), No. 21, pp. 321–327; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 2, pp. 230, 231; Jour. Soc. Chem. Indus., 36 (1917), No. 15, p. 897*).—Experiments were made in an extremely acid soil, very poor in lime, growing rice. The field was in a fertile condition at the commencement of the experiments, having received a dressing of mineral superphosphate and barnyard manure during the previous winter. Three equal areas of the field were sown with paddy rice and manured, respectively, with 500 kg. per hectare (445 lbs. per acre) of tetraphosphate containing 2 per cent of citrate soluble, 7.8 per cent of citric acid soluble, and 28.3 per cent total phosphoric acid, the same amount of ground phosphorite, and 930 kg. of superphosphate. The amount of marketable grain obtained from the tetraphosphate plat was 6,330 kg., from the ground phosphorite plat from 5,730 to 5,906 kg., and from the superphosphate plat 5,690 kg.

What we are doing toward remedying the potash shortage, R. K. Meade (*Commercial Fert., 15 (1917), No. 3, pp. 40, 44, 46, 50*).—This is a brief review of the details of the different new potash industries of the United States. It is believed "that the largest future source of cheap potash available in the country is in the iron industry and cement industry, which could be made to produce almost all of the potash formerly imported from Germany. Other promising sources of small amounts are from the evaporation of brines and from beet-sugar waste. There is always the possibility, too, that some of the processes now proposed for the manufacture of potash direct from greensand or feldspar will prove commercially successful."

A new source of potash, H. T. Cranfield (*Jour. Bd. Agr. [London], 24 (1917), No. 5, pp. 526–530; abs. in Nature [London], 100 (1917), No. 2501, p. 92*).—The author is of the opinion that the flue dust of blast furnaces is the most important source of potash yet discovered in Great Britain. Analyses of flue dusts are given in the table following.

Analyses of flue dusts.

Kind of potash.	Kind of flue dust.											
	Cream.	Black.	Red.	Black.	Black (burnt)	Black.	Black.	Cream.	Red.	Gray.	Light brown.	Gray.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Water soluble..	9.25	....	5.92	1.68	....	2.01	1.23	5.69	4.68	5.88	3.82	4.70
Total (acid soluble).........	15.89	3.13	8.50	2.97	5.12	3.73	3.13	11.82	7.58	12.46	7.51	7.10

It is estimated that there are 300 furnaces in full blast in Great Britain and that each produces 20 tons of black, 5 tons of red, and 1 ton of cream-colored flue dust per week. On the basis that the black dust contains 2.5, the red 7, and the cream-colored 10 per cent of potash, their total annual production would be about 15,000 tons of potash, of which at least 50 per cent is considered to be available.

Commercial fertilizers, P. L. Hibbard (*California Sta. Bul. 286* (*1917*), *pp. 117–166*).—This reports the results of fertilizer inspection work for the year ended June 30, 1917. A total of 506 samples of fertilizers and fertilizer materials was received, 460 being official samples. Deficiencies greater than those allowed by law occurred in 126 samples.

Fertilizer analyses, H. B. McDonnell et al. (*Md. Agr. Col. Quart., No. 77* (*1917*), *pp. 31*).—This is a report of the fertilizer inspection and analysis in Maryland for the period from February, 1917, to June, 1917, inclusive.

Commercial fertilizers, J. L. Hills, C. H. Jones, and G. F. Anderson (*Vermont Sta. Bul. 206* (*1917*), *pp. 5–52, pls. 4*).—Analyses of 171 licensed brands of fertilizers, representing the output of 18 companies and sold in Vermont during 1917, are reported. The quality of the crude stock used is reported as being beyond reproach. All but 4 of the 171 brands carried appreciable amounts of mineral as well as of organic forms of nitrogen, and about ⅓ contained potash. Guaranties were met in 81 per cent of the brands tested. The average selling price was $32.65, but no trade valuation was made owing to the unsettled conditions of the fertilizer industry.

AGRICULTURAL BOTANY.

Plant associations of western Pennsylvania with special reference to physiographic relationship, II, J. E. Cribbs (*Plant World, 20* (*1917*), *No. 5, pp. 142–157, figs. 8*).—The author states that plant associations of western Pennsylvania bear a close relation to the topographical features of that region, so that a given type of vegetation may be expected to grow in widely separated similar environments. This is due to its close relationship to certain factors which are practically decisive.

Desiccation produces much the same result whether due to wind or to sunshine. Soil composition produces no striking differences. Relative humidity resolves itself into a question of soil moisture, which is the most important of the factors determining, directly or indirectly, the composition of the associations. High soil humidity inhibits oxidation, so that acids and other plant by-products accumulate in sufficient quantity to exert possibly a direct influence upon the vegetation. Decay processes may draw oxygen from the supply in the water sufficiently to affect growth. Retention of detrimental materials in the soil is

perhaps a principal hindrance to growth. The relative coldness of the waters from the ravine slopes may be an influence modifying that of soil moisture.

The climax formation of western Pennsylvania is a mesophytic deciduous forest of which Acer, Fagus, Castanea, and Quercus are the dominant members. The composition of the climax formation is directly referable not to physiographical but to climatic conditions.

A list of Japanese fungi, M. SHIRAI and I. MIYAKE (*Tokyo, 1917, 2. ed., pp. 733+78*).—This consists of an alphabetical list of species of fungi known to occur in Japan.

Self-sterility, C. W. MOORE (*Jour. Heredity, 8 (1917), No. 5, pp. 203–207, figs. 3*).—A study of Tradescantia. *Trifolium hybridum*, *Medicago sativa*, and *Papaver rhœas*, regarding their capacity for cross-fertilization as compared with that for self-fertilization, showed differences in this respect in favor of the former method which were notable in case of Tradescantia and somewhat less so in Trifolium. These and other observations noted are thought to be capable of interpretation either on the ground of an inhibitor in the pollen grain or stigma which in some cases prevents a pollen grain from extending itself to the stage of self-pollination, or else on that of an early deficiency of food supply for the tube and its consequent stoppage of longitudinal growth short of the point where self-fertilization is possible. The latter explanation is considered as the more probable, the greater thickness of the pollen tubes in Tradescantia indicating that the food supply is more favorable to the nourishment of a self-pollen tube than it is to that of a cross-pollen tube. The tubes thus express their growth chiefly in thickness and fail to carry the nucleus to the embryo sac.

Artificial production of galls, M. MOLLIARD (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 4, pp. 160–162, fig. 1*).—Larvæ of *Aulax papaveris* were crushed in a small quantity of water which was then filtered under pressure and forced into the pistil (some entering the ovary) of *Papaver rhœas*. This developed a decided hypertrophy in certain of the placental lamellæ resembling the effects produced by the presence of the larvæ themselves. Similar results were obtained with *P. somniferum*, which is said not to be attacked by *A. papaveris*.

The movement of chromatophores, C. SAUVAGEAU (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 4, pp. 158, 159, fig. 1*).—*Saccorhiza bulbosa* is said to exhibit in a remarkable degree the tendency to contract its chromatophores rapidly and considerably on exposure to strong diffused light, this change being reversible in darkness.

Physiology and biology of nitrogen-fixing bacteria, V. L. OMELIANSKIĬ (*Arch. Sci. Biol. [Petrograd], 19 (1915), No. 2, pp. 162–208, pl. 1; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 7, pp. 944, 945; Jour. Soc. Chem. Indus., 36 (1917), No. 1, p. 40*).—The author has endeavored to make a digest of the large amount of existing information on the physiology and biology of *Azotobacter chroococcum*, supplementing this by the results of his own researches. The subjects dealt with are the methods of accumulation of Azotobacter in selected culture, methods of isolation, growth in solid and liquid media, and influence of temperature and aeration. The most attention is devoted to the fixation of free atmospheric nitrogen, and in particular the conditions insuring the highest efficiency of the species under study, with reference not only to the absolute quantity of nitrogen fixed but also to the quantity of nonnitrogenous substances oxidized.

Relations between nitrogen fixation and the consumption of nonnitrogenous organic substances by nitrogen-fixing bacteria, V. L. OMELIANSKIĬ (*Arch. Sci. Biol. [Petrograd], 18 (1915), No. 4, pp. 327–337, figs. 2; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 7, pp.*

943, 944, fig. 1; Jour. Soc. Chem. Indus., 36 (1917), No. 1, p. 40).—Experiments using *Azotobacter chroococcum* and *Clostridium pasteurianum* together are reported. The nutritive medium used was composed of 80 cc. drinking water, 20 cc. 5 per cent linseed extract, 2 gm. dextrose, 0.1 gm. potassium phosphate, 0.05 gm. magnesium sulphate, and 0.5 gm. calcium carbonate. Incubation at from 21 to 22° C. lasted about six weeks.

It was found that a close relation exists between the processes of assimilation and disassimilation in the cell. The process of fixation of nitrogen ran its course uninterruptedly until the available energetic substance was consumed. The quantity of nitrogen fixed was relatively small (1.735 mg. of nitrogen per gram of sugar decomposed), which is attributed to the low degree of activity of the bacterial strains employed in the experiments. Nitrogen fixation and sugar decomposition were parallel and showed a continuous increase throughout the experiment, the maximum taking place in the period between the fifth and fifteenth day.

A comparison between the productivity of the work of the bacteria at different periods of five days each showed that the process of nitrogen fixation was at its best in the first period. "The efficiency of the bacteria declines rapidly during the three following periods, after which, during the final period, it remains at nearly the same level. It may be said, therefore, that during the first periods of growth of the bacteria in question in the nonnitrogenous medium, when the cells of the nitrogen fixers multiply energetically, their work is most efficient. The impression of the low efficiency of the work of these microbes gained from examining the ratio $\frac{+N}{-C}$ at the close of the experiment must be due to the depressing influence resulting from the process being in its last stages."

Fixation of atmospheric nitrogen by mixed cultures, V. L. Omelianskiĭ (*Arch. Sci. Biol. [Petrograd], 18 (1915), No. 4, pp. 338–377, pl. 1; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 7, pp. 942, 943; Jour. Soc. Chem. Indus., 36 (1917), No. 1, p. 40).*—Studies on the fixation of nitrogen in cultures of a large number of races of Azotobacter and *Clostridium pasteurianum* isolated from different Russian soils, associating with them many other microorganisms usually accompanying them in soils, are reported.

It is concluded that "the study of the biochemical reactions by means of which the bacteria in mixed cultures fix atmospheric nitrogen brings out clearly the various aspects of the natural process occurring under conditions of combined action of the different organisms. The organisms acting in combination with the nitrogen-fixing bacteria in upper soil strata are very numerous and they play an extremely important part in the life of the soil. The synergetic activity of nitrogen-fixing and accompanying microbes is, both in laboratory experiments and under natural conditions (cultivable stratum of the soil), of a different character according to the properties of the species taking part in the process and their environment. In other cases the function of the satellite organism seems to consist in fixing the oxygen of the air and in creating the anaerobic environment (for *C. pasteurianum*). The species added to the cultures of nitrogen-fixing microbes sometimes supply the compounds of carbon needed for the process of fixing nitrogen as energetic substance.

In the case of the combination, Azotobacter and *C. pasteurianum*, the function of the former is not confined to fixing the oxygen of the air only and consequently to creating an anaerobic environment for the Clostridium, but this combination is also useful inasmuch as it destroys the injurious

products of disassimilation created by the second (chiefly butyric acid) and maintains the action of the environment (Azotobacter is alkaligenic and the Clostridium acidogenic). The satellite species may also unfavorably affect the nitrogen-fixing organism, either through products of assimilation or by consumption of the carbon compounds needed for nitrogen-fixing. The energetic fixation of oxygen by the satellite aerobic species creates conditions favorable to the development of *C. pasteurianum*, but at the same time hinders the growth of the Azotobacter, which is necessarily aerobic. The form endowed with the maximum vitality and at the same time the most common form in which combination of the nitrogen-fixing organisms takes place in the upper soil strata is that of symbiosis between the aerobic and anaerobic nitrogen fixers, principally between Azotobacter and *C. pasteurianum*. In spite of the opposite properties of the two species, their synergetic activity in the upper strata of the soil results in a harmonious mutual development producing the maximum economy in consumption of energetic substances."

Distribution of nitrogen-fixing bacteria in Russian soils, V. L. Omelianskiĭ and M. Solunskov (*Arch. Sci. Biol. [Petrograd], 18 (1915), No. 5, pp. 459–482, pls. 3; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 7, pp. 941, 942; Jour. Soc. Chem. Indus., 36 (1917), No. 1, p. 40; Chem. Abs., 11 (1917), No. 9, p. 1233*).—Studies conducted at the Imperial Institute of Experimental Medicine, Petrograd, are reported on the occurrence of *Clostridium pasteurianum*, an anaerobic, nitrogen-fixing bacterium, and *Azotobacter chroococcum*, an aerobic, nitrogen-fixing bacterium in soils taken from different depths in 12 different localities of European and Asiatic Russia.

It was found that "Azotobacter and *C. pasteurianum* occur very widely in soils of different characters and in the most divergent regions of the Empire. In some few cases only the nitrogen-fixing agent was isolated, for instance Azotobacter in the sands of the Kirghiz Steppes and in the peat soils in the north of European Russia (Province of Archangel). The races of Azotobacter and *C. pasteurianum* isolated in the inquiries are clearly morphologically distinct, especially those of *C. pasteurianum*. In these experiments, the two bacteria studied exhibited a different fixing power, weaker in Azotobacter than in *C. pasteurianum*, but the figures were very close (1 to 3 mg. of nitrogen per gram of sugar decomposed)."

The action of some olygodynamic elements on nitrogen-fixing bacteria, C. Montanari (*Staz. Sper. Agr. Ital., 50 (1917), No. 2, pp. 69–72; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 6, pp. 838–840*).—Two years' experiments are reported with copper, barium, zinc, lead, and arsenic, using a white, siliceous sand which was so treated as to obtain the best conditions for nitrification. The elements were added either at the beginning of the experiment, at the moment of inoculation, or after nitrification had set in and developed strongly, at rates of 0.01, 0.05, and 0.1 gm. per 100 gm. of sand.

It was found that "the action of some of the elements varied fairly considerably according to whether they were added at the beginning of the experiment or when nitrification was already in progress. In the first case, the addition of copper, even in small quantities, of barium, zinc, lead, and arsenic, the latter in larger quantities only, had a marked inhibiting effect. In the second case, however, owing to its vigorous development, the organism was unaffected except by the largest quanties of arsenic and copper. In none of the experiments did the various elements, even when added in the smallest quantities, have a stimulative or favorable effect on the development of the organisms.

Manganese sulphate was the only exception to this rule. This accounts for the prejudicial action of these elements on nitrogen bacteria."

See also a previous report of experiments with manganese (E. S. R., 33, p. 422).

The germination of seeds in saline solutions, P. Lesage (*Compt. Rend. Acad. Sci.* [*Paris*], *164* (*1917*), *No. 17*, *pp. 639–641*).—The results of a preliminary study of concentration limits of germination of seeds of *Silene gallica*, *Clarkia pulchella*, *Gilia capitata*, and *Linum usitatissimum* in solutions of electrolytes or nonelectrolytes are given in tabular form.

Assimilation of nutrients by [rice] plants, J. Sen (*Rpt. Agr. Research Inst. and Col. Pusa, 1915–16, pp. 16–18; Trop. Agr.* [*Ceylon*], *48* (*1917*), *No. 3, pp. 179, 180*).—A study made of the assimilation of nutrient material by the rice plant at six stages of its development is said to show that the total amount of dry matter in the plant increases up to the time of maturity, the largest increase occurring before the flowering period. Nitrogen decreases continuously, the most rapid decline being noted during the transplantation stage. The parts above ground always exceed the roots in their nitrogen content. The leaves in their earlier stages are twice as rich in nitrogen as the stems. Both leaves and stems lose nitrogen during the formation of the grains, which, when they fill, are about three times as rich in nitrogen as the other parts of the plants. The amount of phosphoric acid was low throughout these tests. Potash increases to the preflowering stage, after which it declines.

By the time the flowers appear the assimilation of nitrogen, phosphoric acid, and potash is fairly complete, so that the supply of these must be available before this time. It does not appear that nitrogen or potash migrates back to the soil. For a yield of 900 lbs. of dry grain, the soil suffers a depletion of 29.33 lbs. nitrogen, 9.64 lbs. phosphoric acid, and 49.69 lbs. potash per acre by the total removal of both grain and straw.

Some sources of ethylgalactosid, Mougne (*Jour. Pharm. et Chim., 7. ser., 15* (*1917*), *No. 11, pp. 345–348*).—Ethylgalactosid β has been obtained in a pure and crystalline state from the products of fermentation in which the presence of galactosid β has been demonstrated. This has been done in the case of a number of plants, some of which are named. The technique of the work is also briefly indicated.

Industrial fumes and injury therefrom to vegetation, V. Sabachnikoff (*Vie Agr. et Rurale, 7* (*1917*), *No. 22, pp. 390–393*).—After a general account of kinds of industrial works giving rise to various substances mentioned as injurious to vegetation, the author states that the effects due to the noxious gases are more important than those due to the corroding influence of even high concentrations of certain acids. The total of the cumulative effects of even weak concentrations of acid gases in the air is said to be very great.

FIELD CROPS.

Experiments in field technique in rod row tests, H. K. Hayes and A. C. Arny (*U. S. Dept. Agr., Jour. Agr. Research, 11* (*1917*), *No. 9, pp. 399–419*).—Preliminary investigations in 1915 with wheat and oats grown in replicated and single rod rows and in duplicated and single $\frac{1}{10}$-acre plats at the Minnesota Experiment Station led to more detailed studies in 1916 of the effects of competition on height and yield between adjacent rows of different varieties and strains of wheat, oats, and barley planted in rod rows when spaced at a distance of 1 ft. apart and of the value of replications for rod row tests. The data were obtained from rod row variety tests made by the farm crops section and from rod row tests made in the plant breeding nursery. This report forms the

first of a series of investigations of field practices in Minnesota to ascertain any lack of uniformity in methods of work.

"In a study of competition between rod rows of small grains grown 1 ft. apart there was some effect on the yield of border rows of the same variety due to height of adjacent rows of barley, winter wheat, and, in one of two tests, an indication of such effect in oats. The results were variable in different plats, such variation being due possibly to the environmental conditions. There was no apparent effect of height of adjacent rows on the yield of border rows of the same variety in spring wheat. The yield of adjacent rows appeared to be of some importance in barley tests and in the farm crops spring-wheat tests. Correlations obtained for other tests indicated considerable soil heterogeneity. The effect of the height of adjacent rows for the barley plant breeding tests was unquestionable. The effects of the height of adjacent rows were sufficient to often cause differences of 4 or 5 bu. per acre in the yield of border rows of the same variety of barley. The comparison of yield variability of border and central rows of check plats of barley, oats, spring, and winter wheat was further evidence of the competitive effect of rod rows of small grains when grown 1 ft. apart. In nearly all tests the border rows proved to be more variable in yield than the central rows.

"In nearly all tests three replications as compared with a single plat reduced error by from 25 to 50 per cent.

"In a study of replications for rod rows of small grains considerable variability was shown for the different tests. In general three or four replications seem to be about as accurate a method as the use of any number below nine. The indications are that from 9 to 12 replications would reduce error due to soil heterogeneity to a minimum."

A bibliography of 16 titles is appended.

Improved technique in preventing access of stray pollen, A. Waller and L. E. Thatcher (*Jour. Amer. Soc. Agron., 9 (1917), No. 4, pp. 191–195, pl. 1*).—A waxed paper capsule for the prevention of contamination by adventitious pollen and used by the authors in plant breeding work at the Ohio State University is described and illustrated. Advantages claimed for this device are as follows:

The translucent paper capsules hinder very little the normal plant processes and are cheap, light, and durable. No other method known to the authors will protect against pollen thrips or other small insects that interfere with pedigreed cultures. Isolation of the inflorescence in the capsules obviates the necessity of locating the cultures in places unfavorable for the plant and inconvenient for observation. The capsule makes possible the isolation of flowers borne on shrubs and trees. The device also protects the developing and ripened fruit.

[Field crops] work of the San Antonio experiment farm in 1916, C. R. Letteer (*U. S. Dept. Agr., Bur. Plant Indus., Work San Antonio Expt. Farm, 1916, pp. 1–16, figs. 3*).—This reports the progress of work continued along the same general lines followed in preceding years (E. S. R., 35, p. 827), including meteorological observations in 1916. Seasonal conditions for 1916 are noted as in many respects very unfavorable for crop production.

Experiments relating to crop rotation and tillage, and corn and cotton culture and variety tests are described, and results obtained in the main similar to those previously noted. The 1916 yields of corn, cotton, sorghum, and oats for grain were slightly higher on biennially cropped land than on land cropped annually, although the differences in favor of the biennial cropping were not deemed sufficient to make the practice profitable.

In field plat tests with flax varieties, yields were obtained amounting to 6.4 bu. per acre for Select Russian (C. I. No. 3), 5 bu. for Smyrna (C. I. No. 30), 4.7 bu. for North Dakota Resistant No. 114 (C. I. No. 13), 2.3 bu. for Punjab (C. I. No. 20), and 0 for Soddo White (C. I. No. 36), with estimated stands of 75, 30, 95, 20, and 0 per cent, respectively. Eight of 12 additional varieties grown in single nursery rows sustained a loss in stand of from only 5 to 10 per cent, with yields estimated to vary from 10.2 to 5.7 bu. per acre. Arranged in order of highest yield these varieties were C. I. Nos. 18, 19, 25, 3, 12, 16, 27, and 14. In date-of-seeding tests with flax, seedings of 25 lbs. per acre of North Dakota resistant No. 114 were made at 15-day intervals beginning October 15 and ending January 5. The yields varied from 0 for the January 5 planting to 9.3 bu. per acre for the November 15 planting.

In variety tests with field peas the Kaiser and Gray Winter were the only varieties to withstand successfully the winter temperatures of 1915–16. The former yielded at the rate of 2,100 lbs. of cured hay and 3.8 bu. of peas per acre and the latter at the rate of 1,800 lbs. of hay and 1.25 bu. of seed per acre. Kerrville, although severely injured by frost, yielded at the rate of 960 lbs. of hay and 2.5 bu. of seed.

[Report of field crops work at the Umatilla experiment farm, Oreg., in 1915 and 1916], R. W. Allen (*U. S. Dept. Agr., Bur. Plant Indus., Work Umatilla Expt. Farm, 1915–16, pp. 16–18, 22–27, 32–37*).—This reports the results of crop rotation experiments by H. K. Dean and numerous variety tests with corn, grain sorghums, and miscellaneous forage crops.

The crop rotation experiments begun in 1915 were planned to study the effect of the combination of crop, manure, and cover crops on crop yield and on the physical condition of the soil. The plats are irrigated by an underground pipe system. Applications of manure amounting to 8 and 32 tons per acre resulted in very pronounced increases in the yields of alfalfa and feterita grain and fodder for 1915 and 1916, with the plats receiving 8 tons yielding more in proportion to the manure used than those receiving 32 tons.

Crops for soil improvement, the harvesting of hairy vetch for seed, and variety tests with soy beans, field peas, vetches, and minor leguminous crops are briefly noted. Variety tests with soy beans in 1915 resulted in yields of hay amounting to 4,823.5 and 4,654 lbs. per acre for Medium Yellow and Auburn, respectively. The highest-yielding variety of field peas in 1915 was Canadian with 4,409 lbs. of hay per acre.

In variety tests with corn for silage during 1913–1915, inclusive, Pride of the North has given the largest yield, although Reid Yellow Dent proved equally as good in 1915. Silver King, with 980 lbs. of grain on the cob, showed the highest grain yield in 1915. Of the sorghum varieties tested in 1915, Red Amber was first in yield of forage with 19,658 lbs. per acre green weight and 10,653 lbs. of stover. Dakota Amber was first in yield of grain, with 1,502 lbs. per acre, and Dwarf hegari second with 1,401 lbs. For new land or coarse land without a high-water table these last are deemed much more desirable than corn, although for productive land corn is regarded as a more satisfactory crop.

Sudan grass sown in 3 ft. rows in 1916 and irrigated at intervals of one, two, and three weeks showed yields amounting to 1,500, 2,800, and 3,000 lbs. of cured hay per acre, respectively, and when sown broadcast yields amounting to 2,200, 2,300, and 3,900 lbs. per acre, respectively. Sown in rows in 1915 Sudan grass gave a yield of 2,228 lbs. of cured hay per acre, including 500 lbs. of seed. A plat from which a soiling crop was taken in July yielded at the rate of 1,757 lbs. of cured forage per acre and 137 lbs. of seed.

Cooperative tests with Sudan grass, Dakota Amber sorghum, Dwarf hegari, and feterita were conducted by farmers on irrigated and nonirrigated lands of eastern Oregon during 1915. Sudan grass is said to have done very well on dry farms but was not so uniformly successful under irrigation. Dakota Amber and Dwarf hegari proved to be superior to feterita under both irrigated and nonirrigated conditions.

Field tests with Japanese sugar cane, teosinte, broom corn, and millet are briefly noted, but none of these crops is deemed suited to the region.

[Field crops work for 1916], D. A. GILCHRIST (*County Northumb. Ed. Com. Bul. 24* (*1916*), *pp. 6–34, 42–49, 51–53, 54–77*).—This reports extensive fertilizer tests on poor pasture lands and old meadows; variety tests with oats, barley, wheat, beans, and root crops; cultural tests with potatoes; tests of the composition of swedes and turnips as affected by varietal, seasonal, and manurial differences; and studies of the manurial requirements of all crops grown in rotation and of the residual value of manures conducted in Northumberland during 1916.

Basic slag has given the best results with poor pastures on heavy soils, while on the lighter soils basic slag with potash has proved most effective. Active nitrogenous fertilizers are said to have depreciated the feeding value of hay on old meadow lands, while phosphatic fertilizers, supplemented with potash when necessary, have greatly developed clover and improved the feeding value of the hay. Basic slag as a supplement to manure has given the best results on old meadow lands. The residual effects of feeding oil cake to grazing stock have not proved as beneficial as was expected.

Early plantings of potatoes gave increased yields over medium and late plantings. Sprouted seed increased the yield more than a ton per acre over unsprouted seed. Injuries from late frosts resulted in a reduction of nearly 50 per cent in the total crop, and in the proportion of large tubers from about 86 to about 60 per cent of the total.

[Field crops work for 1917], D. A. GILCHRIST (*County Northumb. Ed. Com. Bul. 26* (*1917*), *pp. 20–34, 42–77*).—A continuation of work noted above.

Field experiments, 1916 (*Dept. Agr. and Tech. Instr. Ireland Jour.*, *17* (*1917*), *No. 2, pp. 242–256*).—Continuing work previously noted (E. S. R., 36, p. 529), variety tests with barley, mangels, oats, turnips, potatoes, and wheat, and manurial and cultural tests with potatoes and wheat are reported from numerous centers for 1916.

Tests with sprouting seed potatoes showed an average increase in yield for the 13-year period 1903–1915 of nearly 2 tons per acre over unsprouted seed. Cultural tests, including the use of sprouted seed, the application of 20 tons of manure and 6 cwt. of a standard fertilizing mixture, and with the crop sprayed twice at an estimated cost of $20 per acre, yielded an average increase of 4 tons of potatoes over plats seeded with whole, unsprouted tubers, with 20 tons of manure only and unsprayed. Change-of-seed experiments are reported from which it was concluded that where sufficient attention is devoted to the selection of home-grown seed, seed importations are unnecessary.

Comparative tests of farmyard manure and seaweed as a fertilizer for potatoes in the 4-year period 1912–1915 indicated that with applications of equal amounts seaweed did not produce quite so heavy a crop as the manure, but that when seaweed was used with commercial fertilizers muriate of potash could be omitted without any material reduction in yield. A standard mixture of 1 cwt. of sulphate of ammonia, 4 cwt. of acid phosphate, and 1 cwt. of muriate of potash, together with farmyard manure, is recommended for potatoes on most of the soils of Ireland. On peaty soils the above mixture has

given good results, especially when applied at the rate of 9 cwt. per acre. Basic slag was found to be inferior to acid phosphate, and nitrate of soda to sulphate of ammonia on peaty soils.

Red Marvel spring wheat gave the highest yield, with about 48.5 bu. per acre, with Red Fife second with about 47.6 bu., while of the winter wheats tested White Stand-up, with a yield of approximately 45.7 bu., and Queen Wilhelmina, with about 44.8 bu. were best. Fertilizing wheat after root crops was not deemed profitable, but after grass or another grain crop an application of from 2 to 3 cwt. of acid phosphate supplemented by 1 cwt. of sulphate of ammonia in the spring is recommended.

Agricultural experiments.—Report for year 1915–16, W. J. Spafford, A. A. Kilsby, F. Coleman, and L. J. Cook (*Jour. Dept. Agr. So. Aust., 20 (1917), No. 8, pp. 602–613*).—Variety tests with potatoes, oats, barley, and wheat, and fertilizer tests with potatoes and wheat are reported for three experimental centers in South Australia.

The highest potato yield, approximately 8,337 lbs. per acre, was secured from an application of 6 cwt. of lime and 1 cwt. of sulphate of potash as compared with a yield of about 8,071 lbs. obtained from the untreated check.

The highest average wheat yield, 26.55 bu., in fertilizer tests extending over a period of 12 years, 1905–1916, inclusive, was obtained from an application of 1 cwt. of rock phosphate, 0.5 cwt. of sulphate of potash, and 0.5 cwt. of nitrate of soda. A yield of 15.17 bu. was obtained from the untreated check.

[Field crops work at the Coimbatore Agricultural Station], R. C. Wood (*Dept. Agr. Madras, Rpt. Coimbatore Agr. Sta., 1913–14, pp. 38; 1914–15, pp. 27; 1915–16, pp. 22; 1916–17, pp. 19*).—In a continuation of work previously noted (E. S. R., 31, p. 733), variety, cultural, and fertilizer tests are reported with rice, millet, wheat, ragi, cumbu, cotton, gram, sugar cane, and miscellaneous fodder crops for the period of 1913 to 1917, inclusive. Brief notes on meteorological conditions for the period are included.

[Field crops work at the Hagari Agricultural Station], G. R. Hilson (*Dept. Agr. Madras, Rpt. Hagari Agr. Sta., 1913–14, pp. 22; 1914–15, pp. 16; 1915–16, pp. 25; 1916–17, pp. 20*).—Variety and individual selection tests with cotton, grain sorghums, ragi, potatoes, and sugar cane; tests of oil cake and sheep and cattle manure as organic fertilizers; rotation tests with sorghum, gram, millet, and cotton; cultural tests with millet and ragi; and fertilizer tests with sugar cane are briefly reported for the period of 1913 to 1917, inclusive.

Higher yields of sorghum, grain and forage, were obtained with sheep manure than with oil cake or cow manure. The highest yields of grain and fodder were obtained from rotations of sorghum with Bengal gram. Peanuts used as a green manure for sugar cane, and supplemented by 200 lbs. of acid phosphate gave increased yields of cane over green manuring alone.

[Field crops work at the Nandyal Agricultural Station], G. R. Hilson, D. Ananda Rao, and K. Ramasastrulu Nayudu (*Dept. Agr. Madras, Rpt. Nandyal Agr. Sta., 1913–14, pp. 9; 1914–15, pp. 10; 1915–16, pp. 8; 1916–17, pp. 9*).—Cultural, variety, and manurial tests with sorghum, cotton, and miscellaneous cereal and fodder crops are reported for 1913 to 1917, inclusive, with a brief discussion of local agricultural conditions.

Experiments with clovers and grasses, F. G. Stebler (*Landw. Jahrb. Schweiz, 31 (1917), No. 1, pp. 1–43, figs. 11*).—Comparative field tests of French, Spanish, Syrian, Persian, and South Russian alfalfas, eight different clovers, and six grasses are reported. The tabulated data show the green and air-dried weight of the forage, together with a report on the percentage of purity and germinability of the seed, the percentage of usable seed, and the weight of 1,000 seeds for each variety tested.

Concerning alfalfa and soy beans, J. L. HILLS (*Vermont Sta. Bul. 204 (1917), pp. 40–72*).—This article is a compilation of general information relating to the production and use of alfalfa and soy beans, with special reference to Vermont conditions.

Irrigation of alfalfa, S. FORTIER (*U. S. Dept. Agr., Farmers' Bul. 865 (1917), pp. 40, figs. 36*).—A revised and abridged edition of Farmers' Bulletin 373 (E. S. R., 22, p. 135). The use of portable pipe for irrigating alfalfa in regions where water is pumped at considerable expense is described. Additional data are presented on the amount of water required as indicated by field tests at several experimental centers.

Influence of the frequency of irrigation on the yields of alfalfa, R. W. ALLEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Umatilla Expt. Farm, 1915–16, pp. 18, 19*).—Three years' experiments, designed to show the influence of the frequency of irrigation on yields of alfalfa, showed "the highest duty of water to result from irrigating alfalfa at intervals of three weeks, while the greatest return from the land comes from irrigating weekly. The amount of hay produced by weekly irrigations over that derived from biweekly irrigations averages but 0.56 ton for the three years and does not warrant the additional labor of applying the extra 10 irrigations and the 3½ ft. of water used. This excess labor and water are approximately sufficient to produce 4.76 tons of hay per acre when applied to other land. Biweekly irrigations are definitely shown to give the best results from the labor and water involved."

Bean growing in eastern Washington and Oregon and northern Idaho, L. W. FLUHARTY, revised by B. HUNTER (*U. S. Dept. Agr., Farmers' Bul. 907 (1917), pp. 16, figs. 3*).—A revision of Farmers' Bulletin 561 (E. S. R., 30, p. 138).

Red clover experiments.—A second series of investigations relating to the improvement of red clover, H. M. GMELIN (*Cultura, 28 (1916), No. 34, pp. 414–430; 29 (1917), Nos. 341, pp. 1–21, figs. 8; 342, pp. 49–62; 343, pp. 73–85*).—Continuing work previously noted (E. S. R., 33, p. 131), the author reports rather extensive observations of inheritance of flower color (white and red), leaf spot, and compound leaves with more than three leaflets in red clover. Further observations are reported on the isolation of individual plants, the crossing of different clover varieties, the verification of seed color, and the grain weight of different clover races.

Selecting corn seed, E. B. BABCOCK (*California Sta. Circ. 180 (1917), pp. 7, figs. 3*).—A brief, popular discussion on the handling of newly harvested corn, with directions for field selection and for individual plant tests as a means of improving the corn crop.

Manufacturing tests of the official cotton standards for grade, W. S. DEAN and F. TAYLOR (*U. S. Dept. Agr. Bul. 591 (1917), pp. 27, figs. 11*).—This describes spinning and weaving tests conducted during 1916 in representative mills at Fall River, Mass., and in the textile department of the North Carolina College, and bleaching tests made in Fall River and in the New Bedford (Mass.) Textile School to determine the relative intrinsic values of cotton of the grades of middling fair, good middling, middling, low middling, and good ordinary of the official cotton standards of the United States. The chief factors considered were the percentage of waste, the tensile strength of the yarn, the bleaching properties of the yarn and cloth, the moisture content, and other manufacturing properties of the cotton. The cotton employed was from the 1914 crop purchased during May and June of 1915 from the following zones or sections of the cotton belt: Piedmont Plateau, Atlantic Coastal Plains, eastern Gulf Coastal Plains, western Gulf Coastal Plains, and western Prairie Lands and Plateau.

Considerable tabulated data are presented and discussed and the results illustrated by graphs.

In addition to the above a comparison was made of results of spinning tests of the old permissive cotton grades with the present official cotton standards in tests conducted in a representative mill at Danville, Va., in 1913 on cotton from the 1912 crop.

The results of the spinning tests are summarized graphically and conclusions relative to the other observations as follows:

"The results of the moisture determinations emphasize the need of a more exact knowledge of the moisture content of cotton in the various stages of handling and marketing it and of maintaining proper artificial atmospheric conditions while it is in the course of manufacture.

"Tensile-strength tests were made of yarn which had been spun with the use of several twist constants [twists per inch divided by square root of number of yarns]. It was found that the constant of 4.75 which is generally considered standard for upland cottons was excessive. . . .

"The bleaching tests . . . showed that when the goods made from each grade were bleached under identical conditions middling fair and good middling were practically identical in color. The goods made from middling did not produce quite as pure a white as middling fair and good middling, but for commercial purposes gave satisfactory results. The goods made from low middling gave a slightly slaty color when closely compared with the other grades, while the goods made from good ordinary were easily distinguished by a slaty, bluish cast when compared with the goods made from middling cotton or that of a better grade. The lower grades might have been bleached more satisfactorily if in some of the processes the factors of time, concentration, and temperature had been altered.

"A comparison of the waste and tensile strength of the old permissive cotton grades . . . with the results of tests made on the present official cotton standards . . . shows that the changes made in the revision of the old permissive grades did not change the percentages of waste in the corresponding grades, but involved principally the factor of color and affected chiefly the lower grades.

"The tests based on the official cotton standards of the United States show that after making allowances for the losses due to the cleaning processes there is comparatively little difference between the grades above and those below middling in the price paid by the manufacturer for each pound of the usable cotton obtained from bales of the different grades, but that there is a difference in the intrinsic value per pound of the manufactured product. Accordingly, on the basis of quotations and values at the time of the tests, the inducement in the price paid to the farmer for the production of high-grade cotton was not commensurate with the greater value to the manufacturer of the product derived from such cotton."

Pollination and cross-fertilization in the juar plant (Andropogon sorghum), R. J. D. Graham (*Mem. Dept. Agr. India, Bot. Ser., 8 (1916), No. 4, pp. 201–216, pls. 2*).—Pollination and cross-fertilization studies with *A. sorghum*, made on the Nagpur (India) farm from 1908 to 1914, inclusive, are reported. The plants are said to be protogynous, the flowers being normally pollinated from higher flowers of the same panicle. Though typically anemophilous, the flowers were visited by insects, chiefly bees, at certain seasons. This condition probably led to natural cross-pollination, depending on the structure of the panicle, being greater in the loose forms than in the more compact ones.

Flowering occurred in a fairly regular order, the majority opening between 2 and 4 a. m., though stray flowers opened before and after, depending upon atmospheric conditions. The whole process from the time of the opening of the

glumes until the anthers assumed a pendent position occupied an average of 10 minutes, although it occasionally required only 3 minutes, while instances were recorded where 30 minutes were required to complete the process. The flowers opened only once, the glumes remaining open 2 to 3 hours. The stigmas remained outside and appeared quite fresh for 24 hours after the glumes had closed. The length of time required for the whole panicle to complete flowering varied with the size of the inflorescence and the number of flowers, but averaged about 7 days.

Cross-pollination between the flowers of the same panicle was the rule, the pollen from the higher and earlier-opening flowers falling on the stigmas of the lower and later flowers. Cross-pollination by foreign pollen can occur only in the first flowers to open and possibly in those late-opening flowers whose anthers do not dehisce. Self-pollination can occur only where the stigma remains surrounded by anthers which do not fall out.

The relative frequency of foreign pollination was found to be 6 per cent in a loose type of panicle with short glumes and only 0.6 per cent in a compact type of panicle. In Tharthur there was 20 per cent foreign pollination. Ball reported 50 per cent as the maximum.

A number of artificial cross-pollinations were made in a study of grain and glume characters. The grain is said to be either red, white, or yellow, while the glumes vary in length in comparison with the grain, from the commoner type which is shorter than the grain to the less common type which is much longer and completely conceals the grain. This latter type, so far as observed, was always associated with a loose type of panicle. In the grain, red and yellow and red and white behave as simple allelomorphs, red being dominant in both cases. Likewise, yellow and white may behave as simple allelomorphs, or the heterozygote may be red, behaving as a dihybrid with a 9:3:4 ratio for red, yellow, and white, respectively. The simplest explanation is deemed to be that certain white-grained plants were undeveloped reds, requiring the presence of yellow to cause the red color to develop. The long and short glume characters behave as simple allelomorphs.

Variety study of the Irish potato, W. H. Wicks (*Arkansas Sta. Bul. 137 (1917), pp. 3–32, figs. 24*).—This bulletin reports the results of extensive tests conducted at Fayetteville from 1915 to 1917, inclusive, at Van Buren during 1916 and 1917, and at Springdale in 1917, together with storage tests and brief notes on approved methods of potato growing and on the production of a second or fall crop in the State. A classification as to season and color has been made of the varieties employed in the test based on the scheme of classification suggested by Stuart (E. S. R., 32, p. 830). Bliss Triumph, the principal commercial variety of the State, was used as a standard for comparison.

At Fayetteville 62 varieties showed higher average yields than Bliss Triumph, Irish Cobbler being first with 187.16 bu. of marketable tubers per acre, as compared with 70.38 bu. for Bliss Triumph. For the July 15 digging, 6 red and 16 pink varieties gave a higher average yield than the standard variety, while for the June 16 digging Irish Cobbler, Dussex Early Queen, and Early Six Weeks were the only varieties to exceed the State average, 71 bu. per acre.

At Van Buren 17 varieties exceeded the standard, Burpee Extra Early being the best with an average yield of 104.23 bu. of marketable tubers per acre as compared with 69.64 bu. for Bliss Triumph.

The highest yield at Springdale was obtained from White Mammoth, amounting to 152.92 bu. per acre on old land. Bliss Triumph gave a yield of 69.74 bu. on old land. Potatoes grown on old land gave much higher yields in every case than those grown on new land.

A test of varieties propagated from home-grown seed stored in an ordinary farm cellar during 1916 and 1917 at Fayetteville resulted in average yields for the leading varieties of 83.8, 82.29, and 80.47 bu. of marketable tubers per acre for Rural New Yorker No. 2, American Wonder, and Prosperity, respectively. The average loss from decay of these varieties amounted to 53, 42, and 5 per cent, respectively, and varied from 1.5 per cent for Manistee and Norcross to 76 per cent for Quick Crop for all the varieties tested. Bliss Triumph sustained a loss of 25 per cent. Digging dates found most satisfactory for successful storage were from July 1 to 15 in the Ozark region and from June 1 to 10 in the Arkansas River region.

Seed potatoes from the first crop to be used for fall planting were stored in the ground, in sand and mulch, and dry straw mulch, and in cellar, shed, and deep pit at Fayetteville, and in the ground, shed, and cellar at Van Buren. A cooperative test in refrigeration was conducted at Eldorado. Ground storage resulted in considerable loss of seed from decay, while practically no loss was sustained from the other methods. The stand of plants from seed stored in sand and mulch, and in the ground at Fayetteville was 33 per cent greater than that from seed stored in other ways, and at Van Buren 50 per cent greater for seed stored in the ground.

The fall crop of Irish potatoes, W. H. Wicks (*Arkansas Sta. Circ. 30 [1917], pp. 4*).—This briefly outlines methods for growing a second crop of potatoes in Arkansas, and recomends varieties adapted to conditions in the State.

Sugar-cane experiments in the Leeward Islands, 1915–16, H. A. Tempany et al. (*Imp. Dept. Agr. West Indies, Sugar-Cane Expts. Leeward Isl., 1915–16, pts. 1–2, pp. 76, pl. 1*).—Variety and fertilizer trials with sugar cane conducted in Antigua, St. Kitts, and Nevis in 1915–16 are reported as in previous years (E. S. R., 35, p. 443).

In the variety tests at Antigua, the five leading plant canes and their yields per acre were as follows: B. 6308, 32 tons of cane and 5,600 lbs of sucrose; B. 4596, 32.2 tons of cane and 5,160 lbs. of sucrose; B. 1528, 27.8 tons of cane and 4,730 lbs. of sucrose; B. 6388, 25.8 tons of cane and 4,710 lbs. of sucrose; and B. 3922, 25.4 tons of cane and 4.540 lbs. of sucrose. The lowest yield was secured from B. 1753 with 15.2 tons of cane and 2,020 lbs. of sucrose. Of 13 varieties which have been under experimental cultivation for the past 15 years, Sealy Seedling has given the highest mean yield of sucrose, 6,450 lbs. per acre, with B. 208 second with 6,270 lbs., and B. 156 third with 6,150 lbs. The highest yield with ratoon canes for the year was obtained from B. 3747 with 28.5 tons of cane and 4,630 lbs. of sucrose, with B. 3922 second with 26.9 tons of cane and 4,500 lbs. of sucrose. Sealy Seedling, with an average yield of 3,680 lbs. of sucrose per acre, was first of 12 varieties of ratoon canes tested for the past 15 years, and B. 156 second with 3,560 lbs. The lowest yield with ratoon canes for the 1915–16 season was from A. 5, 14.3 tons of cane and 2,040 lbs. of sucrose.

At St. Kitts the five leading plant cane varieties were D. 109 with 36.3 tons of cane and 8,090 lbs. of sucrose, D. 216 with 36.6 tons of cane and 7,930 lbs. of sucrose, B. 4596 with 39 tons of cane and 7,670 lbs. of sucrose, B. 254 with 33.2 tons of cane and 7,620 lbs. of sucrose, and White Transparent with 33.1 tons of cane and 7,540 lbs. of sucrose. The lowest yield was secured from B. 1753 with 20.4 tons of cane and 3,870 lbs. of sucrose. The highest average yield for all seasons was secured from D. 216, 7,930 lbs. of sucrose for one season, with B. 208 second with an average of 7,620 lbs. of sucrose for 16 seasons, and D. 109 third with 7,400 lbs. of sucrose for 11 seasons. In tests with ratoon canes for 1915–16, A. 2 was first with 35 tons of cane and 7,660

lbs. of sucrose, and D. 109 second with 28.2 tons of cane and 6,470 lbs. of sucrose. B. 3289 was lowest with 16.9 tons of cane and 3,660 lbs. of sucrose. The highest average yield of ratoon canes for all seasons was obtained from A. 2 with 5,690 lbs. of sucrose for two seasons. B. 1753 was second with 5,600 lbs. for eight seasons, and B. 208 third with 5,560 lbs. for 15 seasons.

Tests with plant canes only are reported for Nevis, D. 216 being first with 41.9 tons of cane and 8,880 lbs. of sucrose, and D. 1111 second with 40.3 tons of cane and 7,690 lbs. of sucrose. B. 147 was lowest with 24 tons of cane and 4,790 lbs. of sucrose. The highest average yield for all seasons was obtained from D. 216, 8,880 lbs. of sucrose for one season, with D. 1111 second with 6,550 lbs. for two seasons.

Applications of 20 tons of pen manure apparently increased the yield of cane 5.5 tons per acre, while corresponding applications of commercial fertilizers gave exceptionally good returns, due to the favorable climatic conditions which prevailed during the growing season of 1915–16. The highest increase in the fertilizer tests, 11.2 tons of cane per acre, was secured from an application of 80 lbs. of phosphoric acid as basic slag, in addition to 60 lbs. of nitrogen as sulphate of ammonia and 60 lbs. of potash as sulphate of potash. An increase of 10.2 tons followed an application of 60 lbs. of phosphoric acid as acid phosphate in conjunction with nitrogen and potash. An application of 24 lbs. of potash in conjunction with phosphorus and nitrogen showed an increase of 8 tons, while a 40-lb. application showed an increase of only 7.4 tons. Sixty-lb. applications of nitrogen as sulphate of ammonia and nitrate of soda showed increases of 7.3 and 7 tons of cane, respectively.

The three-year-average results, 1913 to 1916, indicate that nitrogen is the most essential element required for conditions in the Leeward Islands. The phosphates were practically without effect, while appreciable increases were obtained from potash if the latter was applied with some nitrogenous material. The average increase in yield from a 20-ton application of pen manure was 5.3 tons. With 60-lb. applications of nitrogen as sulphate of ammonia and nitrate of soda the average increases were 5.2 and 5.1 tons, respectively.

Application of 200 and 400 gal. of molasses per acre showed average increases of 3 and 3.7 tons of cane per acre, respectively.

The results of the permanent manurial experiments at La Guérite, St. Kitts, for the season 1915–16, are reported, but no conclusions drawn. The highest increase in yield, 8.9 tons of cane, was secured from the plat receiving pen manure alone.

The effect of sodium nitrate applied at different stages of growth on the yield, composition, and quality of wheat, J. Davidson and J. A. LeClerc (*Jour. Amer. Soc. Agron., 9 (1917), No. 4, pp. 145–154*).—From the work of LeClerc and Leavitt (E. S. R., 22, p. 730), Shaw and Walters (E. S. R., 26, p. 133), and LeClerc and Yoder (E. S. R., 30, p. 440), it was concluded that the principal factor causing variations in the nitrogen content of wheat was climate. The investigations here reported were undertaken to determine whether climate was responsible for variations in the available nitrates at different stages of growth.

Sodium nitrate was applied at the rate of 320 lbs. per acre at the time when the crop was about 2 in. high, at the time of heading, and at the milk stage. To assure the availability of the nitrate at a particulr stage of growth it was applied in solution, the concentration being 1:100 in all cases. Parallel plats were prepared to which the solid nitrate was applied to check the solution method. All plats received the same amount of water at each of the three stages of growth, and were checked by a series of plats receiving no water.

Additional series of plats received sodium nitrate and potassium chlorid and potassium chlorid alone in order to compare the results obtained under these conditions with those obtained by Headden (E. S. R., 33, p. 41). The treatment of the individual plats for each stage of growth is outlined. The experiments were conducted in 1916 on the Kentucky Experiment Station farm, at Lexington, Ky. The results obtained are reported in tabular form, showing the yield and percentage of grain, percentage of yellowberry and protein content, and the weight per bushel and weight per 1,000 kernels of wheat grown under the various treatments. The conclusions arrived at may be summarized as follows:

The presence of sodium nitrate in the soil at the early stages of growth stimulated vegetative growth and gave greater yields. The nitrate in the soil at the time of heading gave a better quality of grain with regard to color and protein content, but the vegetative growth was not in the the least affected. The nitrate in the soil at the milk stage had no effect on the yield, quality, or protein content of the grain. Identical results were obtained from the plats receiving nitrate in solution and those receiving it in solid form, except that the yields from plats receiving the fertilizer at the first stage were higher in the former case than in the latter. This difference was attributed to a better distribution of the fertilizer when applied in solution.

Potassium chlorid did not affect vegetative growth nor the composition of the grain, but did seem to increase the amount of yellowberry when used alone, agreeing in this respect with results obtained by Headden, as noted above and in more recent investigations (E. S. R., 37, p. 38). No consistent variation was observed in weight per 1,000 kernels or in weight per bushel. Although these experiments are believed to have established a definite correlation between percentage of nitrogen and yellowberry, they did not indicate any such correlation between protein and weight per 1,000 kernels, a correlation found in previous work of LeClerc and his associates. The authors conclude that this may be due to the change from the hard winter wheat variety formerly used to the soft winter wheat variety used in these experiments, or that the causes affecting protein content and color of grain and those affecting the weight per 1,000 kernels are not the same.

The quality of western-grown spring wheat, C. H. Bailey (*Jour. Amer. Soc. Agron., 9 (1917), No. 4, pp. 155–161*).—Data obtained from milling and baking tests made at the Minnesota Grain Inspection Department Laboratory with Washington, Idaho, and Montana wheats of the 1916 crop and showing the percentage of crude protein in each are reported in tabular form and discussed. The samples analyzed included western hard spring wheats, western hard winter wheats, western soft red wheats, Early Baart, Pacific Bluestem, and other western white wheats.

The quantity of Marquis wheat produced in the Pacific Northwest and Montana during 1916 was much larger than usual, due to an increased acreage in certain sections and to the reseeding of winterkilled winter wheat fields in Montana. Marquis grown at Pullman, Wash., was higher in protein content and baking strength than any of the common varieties analyzed, while samples of this variety grown at lower altitudes were, in general, materially lower in baking value and percentage of crude protein than those grown at higher altitudes, the difference being attributed to the shorter growing season under the latter conditions. Marquis grown under dry-farming conditions in Montana was of good milling and baking quality and somewhat superior in these respects to Turkey winter wheat grown in the same districts.

Early Baart samples from the Big Bend district near Lind, Wash., were higher in percentage of crude protein and were nearly as satisfactory from the

baking standpoint as the average spring wheats produced east of the Divide and in the northern Great Plains district.

The soft red and white wheats, such as Jones Winter Fife, Little Club, Red Russian, and Fortyfold, are deemed generally inferior in baking qualities to Marquis and Turkey grown in the same sections.

Winter wheat in the Great Plains area: Relation of cultural methods to production, E. C. Chilcott, J. S. Cole, and J. B. Kuska (*U. S. Dept. Agr. Bul. 595 (1917), pp. 35, fig. 1*).—This presents a study of the yields and of the comparative cost of production, with the resulting profit or loss, of winter wheat grown under various methods of seed-bed preparation at 13 field stations in the Great Plains region, made in such a way as to show the effect of cropping and cultivation in only the year preceding its growth. The investigations cover an aggregate of 75 station years, embodying the data from 1,137 plat years. The area studied included the western portions of North and South Dakota, Nebraska, Kansas, Oklahoma, and Texas and the eastern portions of Montana, Wyoming, Colorado, and New Mexico. The results obtained at each field station are discussed separately, and tabulated data presented giving the yield and cost of production for such cultural treatments as early fall plowing, late fall plowing, subsoiling, listing, disking, green manuring, summer tillage, and previous cropping. A brief description of the soil, with special reference to its depth and water-holding capacity, accompanies the discussion of each field station.

The results obtained in these investigations were in a measure comparable with those found in similar studies with spring wheat, already noted (E. S. R., 33, p. 137), and led to the general conclusion that "in the average of all methods by which the crops are grown winter wheat has a marked advantage over spring wheat, both in yields and profits per acre, at North Platte [Nebr.], Akron [Colo.], and Hays, [Kans.], in the central portion of the Great Plains and at Huntley, Mont. At the other stations, where either crop can be grown profitably, the average differences in favor of either are not great enough to be conclusive from the evidence at hand.

It was further shown that in the case of winter wheat "the average difference in yields between early (deep) and late (shallow) fall plowing is 1 bu. per acre. At most stations the difference is small, while at others the advantage of one over the other depends on the season. At Scottsbluff [Nebr.], North Platte, Hays, and Amarillo [Tex.], the differences are rather consistenly in favor of early plowing, and this method is more profitable at these stations. At the other stations late plowing has netted larger returns.

"Furrowing with a lister after harvest and leveling the ridges preparatory to seeding have resulted in an average increase of 0.9 bu. over early plowing and 2.2 bu. over late plowing. As it is a cheaper method of preparation than plowing, it has consequently been more profitable. At Hays and Amarillo it has been the most profitable method.

"Subsoiling has increased the yields over plowing without subsoiling at 5 of the 10 stations at which it has been studied. At these stations it has been more profitable than ordinary plowing. At the other stations it has been the least profitable of the continuous-cropping methods. It has not shown any value in overcoming drought.

"Disked corn ground has given consistently high yields. This, together with the low cost of preparation, has resulted in this method showing the highest average net returns of any of the methods at all of the 11 stations where it has been tried except at Huntley and Amarillo. These profits are based on the assumption that the corn crop was so utilized as to pay for the cost of producing it.

"Summer tillage has given the highest average yields of any method under trial at 11 of the 13 stations. However, on account of its high cost, due to extra labor and alternate-year cropping, it has not netted the largest returns except at Huntley.

"Green manuring is the most expensive method under investigation. It has given the smallest net returns of any of the methods at all of the stations except Huntley, where the profit from it is slightly greater than from either fall plowing or subsoiling.

"In comparison with spring wheat, winter wheat shows a greater response to summer tillage and is the more profitable crop to grow on land so prepared. This appears to be true at all stations studied except possibly Garden City [Kans.], Dalhart [Tex.], and Tucumcari [N. Mex.], where large average losses attend the growth of either crop."

Extending the area of irrigated wheat in California for 1918, F. Adams (*California Sta. Circ. 182* (*1917*), *pp. 4*).—This briefly outlines the possibilities of increased wheat production in the Sacramento, San Joaquin, and Imperial Valleys of California by a judicious use of available irrigation facilities.

More wheat (*Arkansas Sta. Circ. 31* [*1917*], *pp. 4*).—A brief, practical outline on wheat growing in Arkansas.

Agricultural seed: Concerning the germination of seed, C. P. Burns, A. K. Peitersen, and L. H. Flint (*Vermont Sta. Bul. 205* (*1917*), *pp. 3–48*, *pls. 4*).—This reports the results of purity and germination tests of 365 official samples of agricultural seed collected throughout the State during May, 1917, together with a discussion of the Vermont agricultural seed law. Approximately one-twelfth of the samples analyzed were not guaranteed as required by law and about 2 per cent of those that were guaranteed were found to be seriously deficient in purity.

The importance of the home determination of the viability of seed is emphasized and simple devices for determining the germinability of seed briefly described.

Seed Reporter (*U. S. Dept. Agr., Seed Rptr., 1* (*1917*), *No. 2*, *pp. 8*).—This number contains statistical information and tabular data on the supply of clover and alfalfa seed held by large dealers November 15, 1917, and on the preliminary garden seed survey of November 1.

Market conditions and seed movements are noted as follows: Sorghum seed and German millet in Kansas and Missouri; cowpeas in the cotton States; sweet clover, Sudan grass, and alfalfa in Kansas; clover and timothy at Toledo, Chicago, and Milwaukee; Kentucky bluegrass in Missouri and Iowa; and soy beans in Mississippi and Louisiana. The seed corn situation throughout the corn belt is briefly reviewed and the seed sweet corn situation noted. Thresher reports of clover and timothy in Michigan are given, and tabular data presented on imports of forage plant seed permitted entry into the United States during November.

Special articles include Clover Seed Production, by A. J. Pieters, and The Lespedeza Seed Production and Movement for 1917, by H. S. Coe. The necessity of a reserve supply of cottonseed for 1918 plantings is emphasized. Suggestions relating to the labeling of field crop seeds, as adopted by the U. S. Department of Agriculture and representatives of the seed trade, and later approved by the seed trade associations, provide that lots of 10 lbs., or over, of field crop seeds shall be so labeled as to show the name of the seedsman, the kind of seed, the viability of the seed, and the origin of the seed.

HORTICULTURE.

The winter storage of roots, P. H. Aldrich (*Vermont Sta. Bul. 203 (1917), pp. 3–9*).—Tabular results are given of preliminary studies made with carrots, beets, and parsnips largely to determine the influence of temperature variations during storage, of media, and of disinfectants upon such preservation, as well as of the nature of the modifications occurring in the vegetable structures during storage. The storage period in all cases lasted from November 12 until May 28.

The results of the temperature tests indicate in general that these vegetables should not be stored at living-room temperatures, that beets will store well under cellar conditions, and that carrots and parsnips will keep better under cold-storage conditions.

The media tests indicate that it is not necessary to pack beets in any substance in order to keep them well, but that carrots and parsnips keep somewhat better when packed in alternate layers of sand. Sawdust, newspaper wrappings, and garden soil were less satisfactory as packing media.

Immersing the vegetables for ten minutes in Bordeaux (5:5:10) appeared to improve the keeping quality of carrots and parsnips when stored in the cellar, but was detrimental to beets. A 3-minute immersion in mercuric chlorid (1 tablet to 1 pint) gave decidedly poor results. Immersing the vegetables in paraffin did not injure the keeping quality of beets but gave very poor results with carrots and parsnips.

Moisture determinations were made before and after storage. In general, it may be said that the roots packed in dry media lost in weight; that those packed in moist media gained in weight; that those placed in cold storage gained; and that those treated with disinfectants lost in weight.

Relative to the edible qualities of the vegetables after storage carrots placed in cold storage, packed in dry sand and dry sawdust, as well as those immersed in Bordeaux, were tender and well flavored. The best beets were those packed in moist sand, moist sawdust, or garden soil. The best parsnips were those placed in cold storage, packed in moist sand, moist sawdust, dry sawdust, as well as those immersed in Bordeaux and those immersed in paraffin.

Careful comparisons of the tissues of the three vegetables under study made in the fall and again in the spring after 6.5 months storage led the author to conclude that there is an increase in the amount of fibrous tissue following winter storage in beets, but not in carrots and parsnips. It is thought that the apparent increased toughness and stringiness of the latter in the spring may be due to the thickened trachea tubes, although the correctness of this surmise was not demonstrated. In the case of the beet, however, it was quite clear that increases in fiber tissue occurred to a greater extent in the lots kept under dry than in those kept under moist conditions. This development seemed to be made at the expense of the surrounding companion and parenchyma cells.

Greenhouse-grown radishes were stored on March 12 in cold storage wrapped in cheesecloth, in the cellar, and in the living room. Lots were stored with the tops on and with the tops off. The radishes were preserved in a fairly edible condition under cold storage for about 3 months. Radishes wrapped in cheesecloth and placed in cellar storage were preserved for about 1 month. Those placed in water were preserved for about 3 weeks. Radishes placed in water in the living room were preserved for about 10 days. In all cases the lots on which the tops were left kept better than those which had been topped. There was no noticeable benefit in using distilled water in place of tap water.

War vegetable gardening and the home storage of vegetables (*Washington, D. C.: Nat. War Gard. Com., 1918, pp. 32, figs. 30*).—A compilation on home

gardening and home storage of vegetables, prepared under the direction of the National War Garden Commission.

The forcing of plants by means of warm water immersions, W. G. BODINE (*Vermont Sta. Bul. 203 (1917), pp. 9, 10*).—A brief summary of the results secured in a test of the warm water method of forcing plants (E. S. R., 32, p. 437).

Twigs of wild grape, elm, apple, basswood, cottonwood, and a species of Rubus were gathered on February 10, thawed, and placed for from 4 to 8 hours in water, some at 36° C. (96.8° F.) and some at 7°, and then placed in the greenhouse. The first leaves were observed on the twigs immersed in warm water from 5 to 15 days sooner than they were observed on the twigs immersed in cold water, with all the species other than the apple. For some undiscovered reason the growth of the apple twigs seemed retarded.

Stringless green pod bean seed was soaked for lengths of time ranging from 15 to 120 minutes in water which varied in temperature from 10 to 22° for the cooler water and 37 to 45° for the warmer water. The trials were made in the late fall and early spring. No gains were secured in the earliness or profuseness of growth as a result of soaking either in cold or warm water as compared with untreated seed. Similar trials made with peas gave the same results. Radishes grew a smaller top but a better root when the seed was immersed in water at from 38 to 41° for 45 minutes than they did when the seed was either soaked in cold water or left untreated. Corn and oats treated in the winter months grew better and somewhat larger crops were secured when the seed was soaked at from 36 to 41° for from 4 to 5 hours than when left untreated or when soaked in cold water. No material response followed the warm water treatment of corn and oats in the spring or summer.

The author concludes that temperatures from 30 to 36° are best adapted to experimental needs in most cases, and that a soaking of from 7 to 12 hours for twigs and shrubby plants and of from 2 to 5 hours for seeds seems optimum. Longer exposures are deemed inadvisable. Late spring immersions proved relatively ineffective. The growth stimulus appears to be due to warmth rather than to absorption of water. Seeds soaked in warm water absorb more water than those soaked in cold water, thus softening the seed coats and inducing favorable results.

Colors in vegetable fruits, B. D. HALSTED (*Jour. Heredity, 9 (1918), No. 1, pp. 18–23*).—A discussion of color inheritance in fruits of the tomato, pepper, and eggplant, based upon the author's long-continued breeding investigations at the New Jersey Experiment Stations (E. S. R., 36, p. 838).

[Horticultural investigations at the Umatilla experiment farm, Oreg., in 1915 and 1916], R. W. ALLEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Umatilla Expt. Farm, 1915–16, pp. 12–14, 27–32*).—A brief progress report is given on an apple-orchard cover-crop experiment in which winter crops of vetch and rye, used as green manures, are being compared with alfalfa grown between the tree rows. Thus far no conclusive data have been secured in the experiment.

An experiment was started to determine the comparative success of fruit trees planted on raw land and on alfalfa sod. The results for two seasons, although not conclusive, indicate that better success can be had by starting the trees on alfalfa sod than on raw land, but the growth of the trees does not indicate that two years' growth of alfalfa, followed by plowing a crop of it in, improves the land sufficiently to produce trees of desirable vigor.

Notes are given on the condition of a number of varieties of tree fruits, grapes, and cane fruits under trial at the farm.

[Horticultural experiments at the San Antonio experiment farm in 1916], C. R. LETTEER (*U. S. Dept. Agr., Bur. Plant Indus., Work San Antonio Expt. Farm, 1916, pp. 16–19, fig. 1*).—This comprises brief notes on fruits, nuts, and ornamentals being tested at the station farm.

The handling and precooling of Florida lettuce and celery, H. J. RAMSEY and E. L. MARKELL (*U. S. Dept. Agr. Bul. 601* (*1917*), *pp. 28, figs. 19*).—During the seasons of 1913–14 and 1914–15 investigations were conducted by the Bureau of Plant Industry for the purpose of ascertaining the causes of losses by decay in lettuce and celery shipped from Florida, and to determine practical means of reducing them. In the work with lettuce precooling and holding experiments were conducted at the shipping point and the lettuce was examined at the market, New York City, upon arrival and a few days after arrival. Precooling experiments with celery were conducted at the shipping point and storage experiments after reaching the market in New York City. The results secured from these experiments are presented in a series of tables and diagrams and fully discussed.

The decay in lettuce in transit was found to be due largely to lettuce drop, a disease which appears to enter the head mainly through the lower leaves. The experiments have shown that much of this decay can be avoided by cutting the heads at a point just above these leaves and discarding the head entirely if very many of the leaves are diseased. Lettuce in cars that were precooled at the shipping point to a temperature of about 40° F. developed considerably less decay in transit than that shipped in nonprecooled cars. With careful cutting and precooling the lettuce reached its destination in almost perfect condition and held up much better on the market than lettuce handled in the usual manner.

Precooled celery arrived on the market in a uniformly fresh condition, with the leaves on the top tier nearly as green as those on the bottom. Nonprecooled celery showed very yellow leaves in the top tier, thus discounting the value of the entire load. Precooled celery was stored successfully for four weeks with little decay, whereas nonprecooled celery developed considerable decay during the same storage period. The work indicates that celery from the lower part of a nonprecooled car can be stored for a short period, but during warm weather that on the top tier should be disposed of as soon as it reaches the market. The cost of precooling and initial icing of a car of celery was less than the usual charge for full refrigeration in transit. In warm weather one icing in transit may be required, thus increasing the cost of precooling to about the usual full refrigeration charges.

Concerning quality in celery, J. B. NORTON (*Vermont Sta. Bul. 203* (*1917*), *pp. 10–12*).—A summary of experiments dealing with growth and quality in celery.

In a series of experimental trials wherein plants were grown in water or were given water in amounts ranging downward from 187 cc. to 1 cc. daily, there was no height growth or even shrinkage in height when 15 cc. or less was supplied daily, and increasing height growth when from 31 to 187 cc. was given daily. Celery plants treated with 0.25, 0.5, and 0.75 gm. of nitrate of soda, respectively, showed increased height growth for a period of 30 days roughly proportional to the amounts of fertilizer used. Similar results were obtained by the use of artificial mixtures of half sand and half humus-rich soil and of one-third sand and two-thirds humus-rich soil.

Several plants were grown either in full light, in half light, or in darkness. Intense light hindered growth and lack of light caused an abnormal etiolated growth. The full-lighted crop was dwarfed, stringy, and tough. The half-

lighted crop was of good quality, and the no-light crop was long-stemmed, watery, and subject to disease attack. Celery grown at 80° F. was shorter and far more leafy than that grown at 60° but its quality was not injuriously affected.

It is pointed out that blanching, if properly done, tends to develop a nutty flavor; if improperly done, a bitter flavor. In either case the chlorophyll is profoundly modified or destroyed. Reference is made to experiments conducted at the Maryland Station in which it was shown that pithiness, which is characterized by lack of parenchyma, is due in the self-blanching varieties to heredity, to the propagation of an undesirable strain, or to reversion, but that in other forms of celery it is quite as likely to be due to unfavorable cultural conditions. Careful seed selection, it is believed, should to a large degree obviate this difficulty.

Breeding sweet corn resistant to the corn earworm, G. N. Collins and J. H. Kempton (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 11, pp. 549–572*).—Observations made by O. F. Cook on a variety of field corn growing near Brownsville, Tex., indicated that the greater immunity of southern varieties of field corn to depredations of the corn earworm may be due to the greater development of husks in these varieties as compared with northern varieties. Breeding investigations were started in 1912 by J. H. Kinsler with the idea that the special susceptibility of sweet corn varieties to attacks of the corn earworm may not be due to the character of the seeds alone. Crosses were made between three commercial varieties of sweet corn, Stowell Evergreen, Early Evergreen, and Early Cory, and two varieties of field corn, Brownsville and Marrainto. The work of breeding and selection was continued by the authors, and a biometric study was made of characters believed to be associated with worm resistance. Earworm resistance was tested in 1915 near San Diego, Cal., and in 1916 near Washington, D. C. The results of the investigation are here tabulated and discussed in detail.

The progeny of these crosses have been found to be much less subject to injury from the corn earworm than commercial sweet varieties, and the data secured indicate that the factors concerned in immunity are inherited, and thus capable of improvement. Of the characters measured, prolongation, or the extent to which the husks exceed the ear, was found to be the most closely correlated with low damage. Thickness of the husk covering was associated with low damage to some extent, but only 5 per cent of the larvæ that reach the ear bore through the husk. The occurrence of leaves on the husks appeared to attract the moths or, at least, to afford a location for the eggs. Certain recorded differences between the inter and intraprogeny regression are believed to indicate that the protection is in part due to other characters correlated with husk prolongation and not included in those measured. It was found that in the more immune progenies both the number of larvæ and the damage per larva were low. It is suggested that at least part of the immunity may be due to the presence of some volatile substance distasteful alike to the moth and larvæ. This was not noticeable in the ear, for when gathered at the proper time the immune strains were pronounced by a number of different observers to be fully as sweet as the parent sweet varieties.

"From the experiments here reported it appears that by increasing the length and thickness of the husk covering and reducing the husk leaves varieties of sweet corn can be produced in which damage from the corn earworm is materially lessened. No difficulty was experienced in securing by hybridization and selection the desired plant characters in combination with the seed characters of sweet corn."

Experimental projects of the division of pomology, University of California, W. L. Howard (*Mo. Bul. Com. Hort. Cal., 7 (1918), No. 1-2, pp. 62-64*).—A summarized statement of projects being conducted at Davis, Berkeley, and elsewhere in California.

The science of fruit growing, V. Bogue (*Rochester, N. Y.: Democrat and Chronicle Print, 1917, pp. 37, pl. 1*).—In this booklet the author draws a comparison between the life functions of plants and of animals and presents some views as to how fruit trees should be grown to conform to the laws of nature.

Apple breeding in Canada, W. T. Macoun (*Agr. Gaz. Canada, 5 (1918), No. 2, pp. 126-128*).—A brief summary of results secured from long-continued breeding investigations conducted at the Central Experimental Farm, Ottawa (E. S. R., 36, p. 742).

Citrus culture, P. Guitet-Vauquelin (*La Culture des Citrus. Paris: Augustin Challamel, 1917, pp. 104, figs. 11*).—A treatise on citrus, with special reference to the Mediterranean zone. The introductory chapter discusses the morphology of the genus. The succeeding chapters deal with species and varieties, culture, maladies, and insect remedies, citrus in the industries and in medicine, and summer citrus, such as lemons and limes.

[Coconuts and coffee] (*Proc. Agr. Conf. Malaya, 1 (1917), pp. 64-74, 115-122, 163-170*).—The following papers, with discussions, contributed to the First Agricultural Conference of Malaya, held at Kuala Lumpur, April 25-28, 1917, are here reported: The Diseases and Pests of the Coconut Palm, by R. M. Richards (pp. 64-74); Observations on Coconut Experiments, by G. E. Coombs and W. S. Cookson (pp. 115-122); and The Cultivation of Liberian Coffee, by R. W. Munro (pp. 163-170).

The grafted jujube of China, D. Fairchild (*Jour. Heredity, 9 (1918), No. 1, pp. 3-7, figs. 5*).—An account of the Chinese jujubes that have been tested in recent years by the U. S. Department of Agriculture in various parts of the country. The author indicates regions in which seedling jujubes have been more or less successful and regions that are considered promising for testing the grafted forms.

Chrysanthemum varieties, A. D. Shamel (*Jour. Heredity, 9 (1918), No. 2, pp. 81-84*).—As further evidence of the origin of certain cultivated varieties of ornamental plants through bud variation (E. S. R., 37, pp. 145, 546) the author presents a partial list of chrysanthemum varieties reported by Cramer as originating from bud sports in his review of the known cases of bud variation (E. S. R., 20, p. 325).

Longevity in lily pollen, F. H. Horsford (*Jour. Heredity, 9 (1918), No. 2, p. 90*).—The author found that the pollen of early lily varieties may be preserved for two or three months in small envelopes for use in pollinating late varieties. Pollen of *Lilium auratum* was wrapped in two or three sheets of paraffin paper, kept in a warm, dry place, and successfully used the following spring in pollinating *L. martagon*.

A striking reproductive habit, A. A. Hansen (*Jour. Heredity, 9 (1918), No. 2, p. 85, fig. 1*).—The production of aerial bulbs on stems of the Easter lily, *Lilium longiflorum eximium*, is illustrated and discussed. As experimentally determined, these bulbs produce normal plants, devoid of aerial bulbs; hence it is concluded that the phenomenon is not due to inheritance.

Petalization in the Japanese quince, A. A. Hansen (*Jour. Heredity, 9 (1918), No. 1, pp. 15-17, figs. 2*).—An illustrated discussion of the intergrading of petals and stamens as observed in the Japanese quince (*Cydonia japonica*), with special reference to the utilization of the flowers of this ornamental as illustrative material by teachers and others.

"Bog" gardening with native plants, N. Taylor (*Gard. Mag.* [*N. Y.*], *26* (*1917*), *No. 3, pp. 89–91, figs. 9*).—A discussion of ornamental plants adapted to sour, undrained soils, including directions for making an artificial bog.

FORESTRY.

The administration of the State forests in Hokushu, O. Shishido (*Jour. Col. Agr. Tohoku Imp. Univ.*, *7* (*1917*), *No. 7, pp. 415–449*).—A historical sketch of forest activities on the island of Hokushu, Japan, including an account of the administration of the State forests.

Effects of grazing upon western yellow-pine reproduction in the National Forests of Arizona and New Mexico, R. R. Hill (*U. S. Dept. Agr. Bul. 580* (*1917*), *pp. 27, pls. 3, figs. 2*).—This bulletin presents the results of a study to determine the character and extent of the damage to young growth of western yellow pine in the Southwest from the grazing of live stock, and to find out the best means of keeping such damage at a minimum while permitting the proper utilization of the range. Recommendations are given relative to the application of the results to range management in the Southwest.

Germination of pine seed, E. Wibeck (*Skogsvårdsför. Tidskr.*, *15* (*1917*), *No. 2, pp. 141–174, figs. 4*).—The results are given of germination tests of pine seed secured from different localities in Sweden. Belated germination was found to increase with the inclemency of the climate in the locality from which the seed originated.

The pine tree of north Sweden, N. Sylvén (*Skogsvårdsför. Tidskr.*, *14* (*1916*), *No. 12, pp. 783–884, pl. 1, figs. 53*).—A discussion of two kinds of Swedish pine, *Pinus lapponica* and *P. sylvestris*, with special reference to influence of locality on tree and seed characteristics.

[Rubber cultivation and rubber preparation] (*Proc. Agr. Conf. Malaya, 1* (*1917*), *pp. 3–35, 37–63, 96–114*).—Under these general headings the following papers, with discussions, contributed to the First Agricultural Conference of Malaya, held at Kuala Lumpur, April 25–28, 1917, are here reported: Cultivation and Manuring, by A. P. N. Vesterdal (pp. 3–10); Cultivation, Drainage, and Manuring, by F. G. Spring (pp. 11–19); Thinning Out, by T. J. Cumming (pp. 20–22); Thinning Out, by E. W. King (pp. 23–28); Rubber Seed Selection, by A. H. Malet (pp. 29–32); Rubber Seed Selection, by J. McNicol (pp. 33–35); Clean Clearing, Pests, and Diseases, by W. R. Shelton-Agar (pp. 37–43); Diseases of the Leaves and Stem of *Hevea brasiliensis* in the Malay Peninsula, by R. M. Richards (pp. 44–54); Root Diseases of Hevea and Clean Clearing, by W. N. C. Belgrave (pp. 55–63); Rubber Manufacture and Factory Methods, by F. G. Souter (pp. 96–105); and The Preparation of Plantation Para Rubber, with Special Reference to Future Considerations, by B. J. Eaton (pp. 106–114).

On a new essence from Blepharocalyx gigantea, F. Zelada (*Univ. Tucumán, Inform. Dept. Invest. Indus.*, *1917, pp. 5–13, figs. 3*).—A histological and chemical study of the wood and leaves of this Argentine tree, which yields a turpentine-like essence.

Pulpwood consumption and wood pulp production, 1916, F. H. Smith and R. K. Helphenstine, jr. (*U. S. Dept. Agr., Forest Serv.* [*Pub.*], [*1917*], *pp. 30, figs. 5*).—This comprises the results of a statistical survey of the pulpwood and wood pulp industries in 1916, conducted by the Forest Service in cooperation with the News-Print Manufacturers Association.

The total quantity of pulpwood used by 230 establishments reporting was 5,228,558 cords, an increase of 17 per cent over 1914, the last year for which similar statistics were compiled. The quantity of wood pulp produced in 1916 amounted to 3,271,310 tons, an increase of 13 per cent over 1914.

DISEASES OF PLANTS.

The relation of some rusts to the physiology of their hosts, E. B. Mains (*Amer. Jour. Bot., 4 (1917), No. 4, pp. 179–220, pls. 2*).—The work here outlined was carried on during 1914 to 1916 in order to obtain data regarding the factors which control the obligate condition for parasitism and to determine the sort of substances necessary to such parasitism.

It is stated that the optimum temperature for *Puccinia coronata* and *P. sorghi* is near 20° C. (68° F.) and the maximum for the latter is about 10° higher. *P. sorghi* is favored by moist soil and humid atmosphere, but it develops also on the host under dry conditions. Neither of these fungi appears to injure directly the cells of the area infected. The surrounding areas appear to suffer starvation owing to the withdrawal of the food material by the infected areas. Depriving the host of various nutritive substances reduces the quantity of rust. The fungus is not starved by deprivation of light, except as this reduces the carbohydrate supply of the host. Lack of carbon dioxid has the same effect as darkness in case of *P. sorghi*. Pure cultures of this fungus can be maintained upon sterile seedlings and upon pieces of *Zea mays* floated upon carbohydrate solutions, and it also develops and forms spores on seedlings or pieces of corn leaf in the dark when these are supplied with starch, cane sugar, dextrose, maltose, and dextrin; but it is not able to develop in the dark when the seedlings or leaves are exhausted of carbohydrates and when only mineral nutriment or water is supplied. *P. sorghi* is not able to utilize directly a supply of maltose, dextrose, cane sugar, asparagin, leucin, peptone with or without mineral salts, or decoctions of the host.

The obligate parasitism of the rusts is thought to be explainable by their requirement of some transitory or nascent organic products related to the carbohydrates which they obtain in the living host.

The origin and development of the galls produced by two cedar rust fungi, J. L. Weimer (*Amer. Jour. Bot., 4 (1917), No. 4, pp. 241–251, pls. 5, fig. 1*).—The author states that the galls produced by *Gymnosporangium juniperi-virginianæ* and *G. globosum* on *Juniperus virginiana* originate as modified leaves, the vascular systems of the galls being composed of the enlarged and modified leaf-trace bundles.

The genus Citromyces, G. Pollacci (*Atti Ist. Bot. R. Univ. Pavia, 2. ser., 16 (1916), pp. 121–136, pl. 1*).—The author discusses several species of the genus Citromyces which he thinks should be placed in the genus Penicillium. He has renamed *C. pfefferianus*, which is technically described as *P. pfefferianum*.

Mycological notes, A. Lendner (*Bul. Soc. Bot. Genève, 2. ser., 8 (1916), No. 4–6, pp. 181–185, figs. 3*).—Discussion is given of *Pestalozzia briardi* (said to be identical with *P. monochætoidea*), which is present but does little damage on grapevines, also of a fungus technically described as a new species (*Lophionema chodati*) on *Pinus sylvestris*.

Diseases and injuries of cultivated plants during 1912 (*Ber. Landw. Reichsamte Innern, No. 38 (1916), pp. VIII+354*).—This report deals with the weather in Germany during the year, with the influence of disease and injury on crops (particularly noting those considered as more important), and with the apparatus and materials employed against injurious agencies.

Grain smut in Java, C. J. J. van Hall (*Teysmannia, 28 (1917), No. 1, pp. 24–27*).—Among the diseases which have already appeared on the grains now being tested out with a view to their cultivation in the Dutch East Indies are wheat smut (*Ustilago tritici*) and barley smut (*U. nuda*).

The prevention of bunt, G. P. Darnell-Smith (*Agr. Gaz. N. S. Wales, 28 (1917), No. 3, pp. 185–189*).—Tests reported during a series of years are said to

show that the best average results, considering both freedom from bunt and germinability, are obtained by dipping the seed grain into 1.5 per cent copper sulphate for 3 minutes and then for an equal period of time into limewater. This is considered the standard remedy to be employed for protection from bunt. Formalin lowered the germination percentage. Experiments under conditions of heavy infection of the check plats at Cowra in 1915 and 1916 and at Wagga in 1915 gave, however, better results from dry copper carbonate (2 oz. per bushel) than from the standard method above noted. The use of gaseous formaldehyde gave unsatisfactory results during its year of trial, and the tests are to be repeated with modifications.

Pod blight of the Lima bean caused by Diaporthe phaseolorum, L. L. Harter (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 10, pp. 473–504, pls. 2, figs. 11*).—An account is given of an investigation of pod blight of Lima beans, which was first reported in this country by the botanist of the New Jersey Station (E. S. R., 4, p. 52).

The disease is characterized by circular brown spots on the leaves and large unsightly spots on the nearly mature pods and stems. As a result of a study of the disease and the literature pertaining to it, the author concludes that it is due to *D. phaseolorum*. In addition to its occurrence on the Lime bean, the fungus was found to fruit well on stems of *Melilotus alba*, rice, corn meal, and other starch media. Dilute solutions of formaldehyde, copper sulphate, and mercuric chlorid proved toxic to the spores.

For the control of the pod blight, the author recommends the selection of clean seed which should be disinfected in mercuric chlorid, formalin, or copper sulphate. The plants in the field should be sprayed from the time they are 1 to 2 ft. tall sufficiently often to keep the foliage covered with a copper fungicide.

Cucumber scab caused by Cladosporium cucumerinum, S. P. Doolittle (*Rpt. Mich. Acad. Sci., 17 (1915), pp. 87–116*).—The injury associated with cucumber scab, which is said to have been very severe during the past two seasons in Michigan, Indiana, and Wisconsin, is due partly to the soft rots which gain access through the scab lesions. The author gives an account of a somewhat extended study of the disease, its distribution, effects, and control.

The chief difficulty in the control of this disease lies in the rapid growth of the cucumber plant and fruit and in the rapid development and spread of the fungus. Measures recommended include rotation, destruction of trash and vines, drainage, drilling in rows of ample width, airing and sunning the vines after showers, and frequent spraying coordinated with the weather changes.

Flax wilt: A study of the nature and inheritance of wilt resistance, W. H. Tisdale (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 11, pp. 573–606, pls. 3, figs. 8*).—In a contribution from the Wisconsin Experiment Station, the author gives the results of investigations carried on as to the nature and inheritance of wilt resistance. For the purpose of this study, flax was chosen on account of the ease with which it may be grown, its short growing season, the availability of resistant and susceptible strains, the ease with which the strains are crossed, etc. The wilt, which is due to *Fusarium lini*, was studied at great length.

The fungus was found to penetrate the flax plant through root hairs, young epidermal cells, stomata of seedlings, and perhaps through wounds, invading the tissues of susceptible plants and causing the wilt. No considerable clogging of vessels was observed, and the wilting is believed to be due to several factors, such as the destruction of the young active root system, which partly cuts off the food and water supply of the plant; use of the food and water

supply by the fungus; increased transpiration due to a rise in temperature; and the possible production of toxins which injure the host protoplasm.

As a result of the studies on resistance, it is believed that resistance is essentially of a chemical nature. Inheritance of resistance through hybridization in which susceptible and immune strains were crossed was studied, and resistance was found to be an inherited character which is apparently determined by multiple factors. Great difference was observed in the individuality of plants with respect to the resistant character, as shown by their offspring. The first generation from some crosses is entirely resistant, from some intermediate, and from others entirely susceptible. The degree of resistance appears to depend to a considerable extent on the environmental conditions under which the plants are grown. Plants of North Dakota Resistant No. 114 were found not entirely resistant under the high summer temperatures in the greenhouse.

In conducting experiments of this kind, the author suggests that all parent strains to be used in crossing be thoroughly tested on infected soils under unfavorable conditions before making crosses, and that hybridization experiments be conducted under uniform environmental conditions in order to obtain conclusive results.

On the resistance to fungicides shown by the hop mildew (Sphærotheca humuli) in different stages of development, E. S. SALMON (*Ann. Appl. Biol., 3* (*1917*), *No. 2–3, pp. 93–96, pl. 1*).—The experiments carried out on Erysiphaceæ, as previously noted by the author in connection with Eyre (E. S. R., 37, p. 47), were conducted on the assumption that the resistance of the fungus to the fungicidal properties of a chemical would be highest when conidiophores and conidia were most evident. Experiments by the author during 1916 with hop plants, however, are said to have shown that the mildew growing on the host plant is more difficult to kill when at an earlier stage of its development. The details of two experiments are given. Evidence collected is said to indicate that the age of the mildew, even when in the powdery conidial stage, is a factor of importance, the older conidial patches showing less power of resistance than the young patches to the soluble sulphid spray. Apparently the age and condition of the leaf are to some extent concerned, the mildew on old hop leaves having less resistance than on vigorous young leaves. Other factors are thought to be involved. It still remains to be determined at what stage it is most economical to employ the fungicide.

Neck rot disease of onions, M. T. MUNN (*New York State Sta. Bul. 437* (*1917*), *pp. 363–455, pls. 11, fig. 1*).—Under the name neck rot disease the author describes an affection of onions known to occur in all the principal onion sections of the United States, where it causes heavy losses in stored onions and frequently in the growing crop and the seed crop.

The cause of the disease has been referred to a number of species of fungi, but as a result of his studies the author claims that it is due to *Botrytis allii*. The infection of the bulbs in the field is said to occur through the leaves and necks, the fungus passing down the neck and causing a rot in the field or else going into the storage house where the disease develops rapidly under favorable conditions. The bulbs may also become infected from the soil and the seed heads from wind-blown spores which cause a blasting of the flowers.

As a result of his investigations, the author has found that the fungus produces appreciable amounts of oxalic acid, but no pathological effect of this acid could be demonstrated. It was found, however, that pectinase was secreted, and from a study of extracts of this material acting on plant tissue, a possible explanation was secured of the tissue changes taking place when the parasite attacks the host.

Various factors favorable to infection were noted, among them immaturity and imperfect curing of the bulbs; the application of commercial fertilizers late in the season or in incorrect proportions; the application of large quantities of stable manure before planting; poor air drainage in the field; and high humidity, high temperature, and poor ventilation in the storage house.

Methods of control have been worked out which include field sanitation, care of the curing crop, and storing in properly constructed and regulated houses. Fumigation of the stock with formaldehyde gas just before or just after storing has been found ineffective against the fungus. While spraying the growing crop with Bordeaux mixture has given some promising results, this method of treatment has not been tested sufficiently to warrant definite recommendations.

A bibliography is appended.

Onion neck-rot in storage houses, F. H. Hall (*New York State Sta. Bul. 437, popular ed. (1917), pp. 8, figs. 3*).—A popular edition of the above.

Early blight of potato and related plants, R. D. Rands (*Wisconsin Sta. Research Bul. 42 (1917), pp. 48, figs. 10*).—The history, occurrence, and economic importance of early blight of potatoes and related plants due to *Alternaria solani* are given, together with studies on the host range of the fungus and its morphology, physiology, and life history.

The disease, which is said to be practically world-wide, causes premature death of the foliage and thus indirectly damages the crop. In Wisconsin, the fungus is known to occur on the potato, tomato, and eggplant, the species previously reported on the jimson weed being a different form to which the author has given the name *A. crassa*.

Early blight is said ordinarily to make little development until the host plant has passed its period of greatest vigor and is being weakened by external conditions or the drain of tuber formation. Climate and soil were found to exert a controlling influence on the disease, and the conclusion is reached that the development of early blight requires relatively high temperatures alternating with moist periods, in combination with a more or less weakened condition of the plant.

Crop rotation and the destruction of dead potato tops, together with spraying with Bordeaux mixture, are recommended for the control of the disease.

Study of a bacterial disease of soy bean and the nature of the root nodules of Glycine soja and Arachis hypogæa, P. C. van der Wolk (*Cultura, 28 (1916), Nos. 336, pp. 268–285; 337, pp. 300–319*).—Besides a discussion of parasitic and so-called symbiotic relationships, the author gives an account, with his explanations, of a soy-bean disease which, appearing first as an etiolated condition, may result in the death of the plant. The trouble appeared to be due to the activities of the bacterium (*Rhizobium beyerinckii*) associated with the root nodules, which are here compared with plant galls.

In health, the nodule maintains close relationship with the leguminous plant by means of outgrowths suggestive of the haustoria of some parasitic plants. Detached nodules, no matter how small, kept in nutritive media but not those kept in water, acted somewhat as individual organisms, attaining a considerably larger size than those naturally attached. The normal and the abnormal processes, as well as the forms and structures which occur in the rootlets, are described in some detail, as is also the behavior of these outgrowths in healthy and in diseased plants.

The trouble appears to be connected primarily with the lowering of resistance and decrease of protective products in the single layer of cells lying between the nodule and the rootlet proper and normally acting as an absorbing organ and also a barrier to these bacteria and furnishing an antidote for their

harmful products. The absence or inefficiency of this barrier results in a condition described as a successful parasitism of the plant by its own nodule bacteria or by abnormally developed outgrowths from the altered nodular structure itself, which thus behaves as a foreign body or a parasitic organism.

The results are discussed of the examination of a large number of Arachis and Soja plants, both of which are found to be subject to this trouble when growing under unfavorable conditions. It is thought that this disorder may be somewhat common in leguminous plants.

Orobanche ramosa and O. cumana parasites of tobacco in Roumania, I. Grințescu (*Bul. Dir. Gen. Reg. Monopol. Stat.* [*Roumania*], *2* (*1914–15*), *No. 3–4, pp. 10–31, pls. 2, figs. 7; 3* (*1915–16*), *Nos. 1–2, pp. 1–28, figs. 7; 3–4, pp. 20–23; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 7* (*1916*), *No. 5, pp. 761, 762; Bol. Tec. Colliv. Tabacchi* [*Scafati*], *15* (*1916*), *No. 3–6, p. 91*).—It is stated that among the numerous enemies of tobacco in Roumania the Orobanchaceæ hold first place for both harmfulness and rapidity of spread. The species known in the various localities named are *Phelipæa* (*O.*) *ramosa* and *O. cumana*, the last being now reported for the first time as parasitic on tobacco in that country. Descriptions are given of both species, their varieties, origin, distribution, and the control measures employed.

Other cultivated plants attacked by these species include hemp, potatoes, and pumpkin.

Dying of young fruit trees, R. Waters (*Jour. Agr.* [*New Zeal.*], *12* (*1916*), *No. 2, pp. 112–121, figs. 3*).—Following up the introductory article on this subject by Cockayne (E. S. R., 35, p. 456), the author states that in the course of the preliminary investigations conducted by himself concerning the mortality among fruit trees, thousands of young trees were found to be affected with apple canker (*Nectria ditissima*), New Zealand root fungus (*Rosellinia radiciperda*), dieback (somewhat rarely), or the sour sap condition mentioned in the article referred to.

No fructifications have yet been found on apple twigs showing dieback. The sour sap condition, said to be by far the most common disorder of young apple trees in the Dominion, is closely associated with fructifications producing red or golden fibrils and closely resembling those of apple bark fungus (*Valsa ambiens*); with fructifications producing black or white fibrils; or with a fungus the stromata of which burst through the bark and give crescent-shaped summer conidia similar to those of apricot coral spot (*N. cinnabarina*). Much evidence favors the view that sour sap develops almost exclusively on trees previously weakened by unfavorable soil conditions or treatment, forms of which are discussed under the heads of soil preparation, soil water, feeble nursery stock, unsuitable varieties, bad planting, lack of shelter, and pruning, with mention of other possible causes.

Dying of young fruit trees, R. Waters (*Jour. Agr.* [*New Zeal.*], *14* (*1917*), *No. 3, pp. 190–196*).—Emphasizing the claim noted above that the main cause of debility resulting in sour sap of fruit trees is the undue accumulation of water in the low situations in which they are planted and the consequent lack of aeration in the soil, the author outlines the apparent relations of the sour sap condition to the various fungi found in connection therewith.

This condition in the wood, cambium, and bark of young apple trees is commonly followed by the appearance of at least six kinds of spore-bearing organisms, of which there have been identified, with more or less probability, *Valsa ambiens*, *V. auerswaldii*, *Diplodia griffoni*, and *Fusarium lateritium*. The most marked results of inoculation which were obtained came from tests with a fungus which has not yet been identified. It appears that the fungi associated

with sour sap are commonly saprophytes which are favored by conditions unfavorable to healthy growth, no conclusive evidence of parasitism having yet been obtained. The remedy suggested is removal of the predisposing conditions, particularly that of excessive soil water, though other factors also require attention.

An undescribed bark canker of apple and the associated organism, G. H. Coons (*Rpt. Mich. Acad. Sci., 17 (1915), pp. 117–122, pl. 1*).—Owing to delay in the publication of this report, the new combination (*Plenodomus fuscomaculans*) here proposed has already appeared in other communications by the author (E. S. R., 34, p. 647; 35, p. 653). The canker is here described, and the morphology and classification of the organism are discussed.

A blossom wilt and canker of apple trees, H. Wormald (*Ann. Appl. Biol., 3 (1917), No. 4, pp. 159–204, pls. 3*).—Having carried forward the work previously reported by Salmon (E. S. R., 32, p. 148) on brown rot canker of apple, said to be increasing in intensity and destructiveness year by year in the southeast of England and attacking many, perhaps all, of the local varieties, the author gives the results of a comparison of the blossom wilt fungus with other Monilias of fruit trees, with the results of inoculation tests and of other studies.

Infection takes place through the open flowers, invading the spur and sometimes resulting in a branch canker. These dead portions produce pustules during the winter and spring, conidia from which infect the blossoms and cause the wilt. After shedding the conidia the canker becomes callused, and the lesion eventually heals. Inoculation of apple blossoms with pure cultures resulted in the death of the inflorescences and spurs and in some cases in cankers, conidia-bearing pustules appearing on the parts during the following winter.

The causal organism is said to be easily distinguished from *M. fructigena* and is provisionally referred to *M. cinerea*, but it is said to show on culture media a different habit from the fungus bearing that name in America.

Removal of all infected spurs before the blooms open checks the disease, as does also spraying so as to prevent the conidial pustules from shedding their conidia during the period of blooming.

The blossom wilt and canker disease of apple trees, H. Wormald (*Jour. Bd. Agr. [London], 24 (1917), No. 5, pp. 504–513, pls. 4*).—The information given in the article noted above from another source is here briefly presented, with some advice to fruit growers.

The gnarly apple disease of 1914, W. H. Venable (*Vermont Sta. Bul. 203 (1917), pp. 12, 13*).—A description is given of a serious trouble of apples in 1914 in Vermont and New York, in which the fruit was misshapen, depressed, and indented, the flesh below being a mass of brownish, corky tissue. No organism has been found in connection with this trouble, and it is believed to have been due to late frost injury, a sharp frost having been reported during a period when the trees were in full bloom.

The effect of fungicide on the spore germination of Longyear's Alternaria, R. W. Goss and S. P. Doolittle (*Rpt. Mich. Acad. Sci., 17 (1915), pp. 183–187*).—An organism, sometimes referred to as Longyear's Alternaria (E. S. R., 17, p. 780), has been shown to infect apples in widely scattered regions of the United States, causing a core rot which appears to be more susceptible to the influence of Bordeaux mixture than of any other preparation tested, though several which are named gave a measure of control, and lead arsenate increased the value of several. The author gives a brief account of varietal susceptibility, symptoms, microscopical characters, cultural characteristics, and fungicidal tests.

Lime as a preventive and remedy for gummosis and brown rot in stone fruits, W. M. FAULKNER (*[Corvallis, Oreg.]: Benton County Courier, 1917, pp. 34, figs. 3*).—Tests carried out for several years are claimed to have shown that slaked lime applied to the roots of young trees as indicated will prevent or cure brown rot or gummosis in sour or sweet cherry, also brown rot of prune or peach. The amount to be used varies from 1 to 3 tons per acre, according to the degree of sourness of the soil. The same result may be obtained, it is claimed, by the use of 4 or 5 times as much hardwood ashes.

The fig canker, caused by Phoma cinerescens, E. S. SALMON and H. WORMALD (*Ann. Appl. Biol., 3 (1916), No. 1, pp. 1–12, pls. 2, fig. 1*).—Fig trees of all ages on plantations in the district of Sompting, Sussex, were found in 1914 to be suffering from fungus attacks of two kinds, one of these being a Botrytis causing a die-back which is still under investigation. The other disease is a canker on both the young and the older branches, often close to the ground. The disease is of serious economic importance and may threaten the future of fig growing in this district. The constant occurrence of a fungus with pycnidial fructifications on the cankered area was noted in the field. The causal organism, apparently a wound parasite, has been examined and supposedly identified with *P. cinerescens*.

Temperatures of the cranberry regions of the United States in relation to the growth of certain fungi, N. E. STEVENS (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 10, pp. 521–529, figs. 3*).—Studies have been made of the temperature and rainfall of the principal cranberry regions of the United States in connection with the occurrence of the fruit rots due to *Glomerella cingulata* and *Fusicoccum putrefaciens*.

These fungi were found to vary greatly in their temperature requirements, and this fact is believed to indicate that the problem of their control will be very different on the Pacific coast and in the eastern United States.

Orange rusts of Rubus, J. C. ARTHUR (*Bot. Gaz., 63 (1917), No. 6, pp. 501–515, fig. 1*).—The writer, concurring in the opinion held by Kunkel (E. S. R., 37, p. 457) that the two forms of rust on Rubus are distinct and that one is *Gymnoconia interstitialis*, has described the other as a new genus and species, *Kunkelia nitens*. He discusses the æcial and the telial form in connection with the hosts used by each form, indicating the geographic range of these two fungi.

The efficacy of Bordeaux mixture, V. VERMOREL (*Compt. Rend. Acad. Agr. France, 3 (1917), No. 3, pp. 80, 81*).—The author, referring briefly to his work with Dantony on grape downy mildew (E. S. R., 38, pp. 153, 154), states that the claim of superiority for acid Bordeaux mixture should be made instead for the alkaline spray, which alone should be employed. A strength of 1 per cent of the alkaline mixture is claimed to be even more efficacious than one of 2 per cent of the acid spray. It is claimed that the general adoption of the alkaline spray at the lower concentration would result in a large saving annually. Excess of lime is said to be harmless.

Report on fungus rot [of avocado], W. T. HORNE (*Rpt. Cal. Avocado Assoc., 1915, pp. 13–16*).—A brief descriptive account is given of several types of decay and of organisms present, including both fungi (some of which are named) and bacteria. One rot organism in particular is said to be indistinguishable from that causing black rot of apples in the Middle States. It is suggested that this rot may become very important in connection with avocado culture.

Citrus scab in Porto Rico, J. A. STEVENSON (*Porto Rico Dept. Agr. Sta. Bul. 17 (1917), pp. 16*).—A popular account is given of citrus scab, which is particularly injurious to grapefruit in Porto Rico, with suggestions for some means of reducing loss.

Brown spot of Emperor mandarins, G. P. Darnell-Smith (*Agr. Gaz. N. S. Wales, 28 (1917), No. 3, pp. 190–196*).—The present article describes in greater detail the experiments (E. S. R., 37, p. 352) conducted during the last two years in connection with control of brown spot of the Emperor mandarin due to *Colletotrichum glœosporioides*.

The first essential is destruction of diseased wood. An excellent spray is Bordeaux mixture, which is not injurious at a strength of 6:4:50, though half this strength is sufficient after the disease has been brought under control. Early spraying is very essential, but very frequent spraying apparently tends to increase the red scale.

Walnut blight in the eastern United States, S. M. McMurran (*U. S. Dept. Agr. Bul. 611 (1917), pp. 7, pls. 2*).—According to the author, walnut blight, or bacteriosis, which has proved very destructive on the Pacific coast, is known to occur in Louisiana, the District of Columbia, Maryland, Delaware, Pennsylvania, and New York.

Studies of the organism causing the disease, made in the summer of 1916, gave results similar to those described from California. Based on the single season's observation, the author reports that late infections are the rule. If this condition should generally hold true, it constitutes a striking difference between the disease in the Middle Atlantic States and that on the Pacific coast.

As the results of spraying experiments for the control of the disease in California have not been satisfactory, the author recommends testing and developing resistant varieties.

Narcissus disease, J. K. Ramsbottom (*Gard. Chron., 3. ser., 61 (1917), Nos. 1586, p. 207; 1587, pp. 217, 218; 1588, pp. 226, 227*).—This is a report of a recent study carried out at Wisley on a disease of narcissus which has been attributed to a Fusarium, but is now definitely stated to be due to the nematode *Tylenchus devastatrix*. Field observations show that the disease may appear first in the neck of the bulb, the leaves at and below the soil surface decaying and falling over without showing the twisted growth characteristic of a diseased bulb. The nematode is an active parasite, but has not been shown to pass from bulb to bulb in storage. The organism has been found in both mature and immature carpels. It may pass from the diseased parent bulb to the offset by way of the basal plate, or vice versa. Fusarium is thought to play but a small part in the production of the disease phenomena observed in this connection. Discussion of preventive and remedial measures includes rotation, trenching, trap plants, heat, formalin, and lime-sulphur.

The place of origin of this disease is not known.

Narcissus disease, J. K. Ramsbottom (*Gard. Chron., 3. ser., 61 (1917), No. 1586, p. 204*).—This is a summary of the work above noted, with mention of other studies on eel-worm or nematode disease of narcissus.

Oïdium quercinum on chestnut, A. Trotter (*Alpe [Italy], 2. ser., 3 (1916), No. 2, pp. 49–53; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 5, pp. 758, 759*).—The author notes the occurrence of the oak Oïdium (*O. quercinum*) on chestnut, as previously mentioned by Farneti (E. S. R., 24, p. 652). In the case now recorded the attack occurred on sprouts growing from stumps of trees cut out of season. This attack may have been conditioned, it is thought, by weakness of the host plants due to the late cutting (not earlier than August 1), the altitude, and the fact that the fungus was then in or near its most actively reproductive stage.

An epidemic of Cronartium comptoniæ at the Roscommon State nurseries, C. H. Kauffman and E. B. Mains (*Rpt. Mich. Acad. Sci., 17 (1915), pp. 188,*

189).—Pines at Roscommon (*Pinus ponderosa* and *P. contorta*, but not Scotch pine) were found in 1914 to be infected with a blister rust, the *Peridermium comptoniæ* stage attacking almost every seedling pine, some of which died. *Myrica asplenifolia* showed on its rusted leaves the pustules of the uredospore and the teleutospore stage of *C. comptoniæ*. The teleutospores infect the pine seedlings, the mycelium growing slowly under the bark two or three years, the hypertrophy also developing very slowly. Æcidiospores produced by the Peridermium stage on the pine infected the sweet ferns during the spring or early summer. It is considered possible that the rust is harbored by one or more of the native pines.

[Rubber diseases], R. D. Anstead (*Planters' Chron., 11 (1916), No. 50, pp. 628–630*).—This is a very brief acount of observations on pink disease of rubber, by the author and by W. McRea, and on the good effects of Bordeaux mixture employed in this connection, with an account of preliminary steps taken to inaugurate experimentation on five estates totaling 900 acres.

Abnormal leaf fall of Hevea rubber, R. D. Anstead (*Planters' Chron., 12 (1917), No. 5, pp. 54–56*).—A program has been drawn up and circulated to the several estates undertaking the study of the leaf fall diseases of rubber. The treatment which is to be thus tested includes the removal of all branches which have died back, also the previous year's fruits and fruit stalks; the collection and destruction of all leaves, fruits, twigs, and branches found on the ground; and the removal of all fruits by June 1 to 10. An alternative to this treatment is the removal by June 1 of the flowers and any stray fruits which may have developed from flowers overlooked.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Principles of economic zoology, L. S. and M. C. Daugherty (*Philadelphia and London: W. B. Saunders Co., 1917, 2. ed., rev., pp. IX+428, figs. 302*).—A second edition of the work previously noted (E. S. R., 30, p. 52).

Game laws for 1917, G. A. Lawyer, W. F. Bancroft, and F. L. Earnshaw (*U. S. Dept. Agr., Farmers' Bul. 910 (1917), pp. 70*).—The usual annual summary of the provisions of Federal, State, and provincial statutes, the provisions having been arranged mainly by States and Provinces.

Laws relating to fur-bearing animals, 1917, D. E. Lantz (*U. S. Dept. Agr., Farmers' Bul. 911 (1917), pp. 31*).—This is the usual summary of laws in the United States and Canada relating to trapping, open seasons, propagation, and bounties.

Control of the jack rabbit pest in Nevada, R. A. Ward (*Agr. Ext. Univ. Nev. Bul. 13 (1917), pp. 11, fig. 1*).—This is a discussion of the necessity of organized community and farm campaigns, crops destroyed by rabbits, and the ways and means of rabbit extermination.

Control of the California ground squirrel, J. Dixon (*California Sta. Circ. 181 (1917), pp. 14, figs. 3*).—This is a popular account which gives a brief description of the California or "digger" squirrel (*Citellus beecheyi* and subspecies) and measures for its control. It is pointed out that the five most effective methods of destroying these squirrels are (1) poisoning with strychnin; (2) fumigation with carbon bisulphid; (3) trapping; (4) shooting; and (5) encouragement of the natural enemies. Carbon bisulphid is most effective when the soil is damp; strychnin-coated barley is best used during the dry season; trapping and shooting are effective at any time, but are from six to twelve times more so before the young are out, before April 1, than later in the season. Powdered strychnin (sulphate) in fresh vegetables and fruit is specially effective in the dry season when green food is scarce.

Handbook of birds of the western United States, including the Great Plains, Great Basin, Pacific slope, and Lower Rio Grande Valley, FLORENCE M. BAILEY (*Boston and New York: Houghton Mifflin Co., 1917, 7. ed., rev., pp. LI+574, pls. 33, figs. 601*).—A revised pocket edition of the work previously noted (E. S. R., 14, p. 551).

Notes on North American birds, H. C. OBERHOLSER (*Auk, 34 (1917), Nos. 2, pp. 191–196; 3, pp. 321–329; 4, pp. 465–470*).

Notes on the genus Puffinus, H. C. OBERHOLSER (*Auk, 34 (1917), No. 4, pp. 471–475*).

The shedding of the stomach lining by birds, particularly as exemplified by the Anatidæ, W. L. MCATEE (*Auk, 34 (1917), No. 4, pp. 415–421, pls. 2*).

The food of nestling birds, H. E. ENDERS and W. SCOTT (*Proc. Ind. Acad. Sci., 1915, pp. 323–337; abs. in Auk, 34 (1917), No. 4, pp. 494, 495*).—This is a report of field studies of the number of feedings of broods of the brown thrasher, robin, wood pewee, and kingbird and the general nature of their food.

English sparrow (Passer domesticus) feeding on the larva of the elm-tree beetle, N. E. WILMOT (*Auk, 34 (1917), No. 4, pp. 479, 480*).—In addition to feeding on the elm-tree beetle in large numbers on the trunks of trees, the author observed the English sparrow to feed upon small moths on the wing, May beetles, etc. He is of the opinion that this sparrow is becoming more insectivorous each year.

[The attraction and protection of birds], E. H. FORBUSH (*Agr. of Mass., 1916, pt. 2, pp. 191–263, pls. 7, figs. 10*).—A discussion (1) of the food plants that attract birds and protect fruit, including diagrams taken from Farmers' Bulletin 621, previously noted (E. S. R., 32, p. 347), which show the seasons of fruits attractive to birds and of fruits useful to protect cultivated varieties, and (2) of the natural enemies of birds as previously noted (E. S. R., 38, p. 54).

Hydrocyanic acid gas as a soil fumigant, E. R. DE ONG (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 9, pp. 421–436, pl. 1, fig. 1*).—This is a detailed report of investigations conducted at the California Experiment Station, the results of which have been summarized as follows:

"The toxicity of hydrocyanic acid gas solutions varied with the insects experimented upon, from the minimum for house flies of 0.0156 gm. of sodium cyanid per liter (equivalent to 0.0046 per cent of hydrocyanic acid gas over the solution) to the maximum for beetles of 0.125 gm. sodium cyanid per liter (equivalent to 0.0365 per cent of hydrocyanic acid gas over the solution), the latter being the most resistant of any insect experimented upon. Gas from a solution of approximately the same strength as that used above on house flies retarded the germination total of lettuce seed 11.3 per cent. Lettuce seed is not killed by two days' exposure to hydrocyanic acid gas as strong as 0.0366 gm. of sodium cyanid per liter (equivalent to 0.0109 per cent of hydrocyanic acid gas over the solution) and will give a good germination percentage if removed at the end of this time.

"Stimulation was greatest at a point one-sixteenth of that causing retardation, namely, 0.0011 gm. of sodium cyanid per liter (approximately 0.00033 per cent of hydrocyanic acid gas over the solution).

"Solutions of hydrocyanic acid gas approximately 256 times as strong as that necessary to produce gas having the minimum killing strength for flies were fatal to all seedlings tested and to 50 per cent of the cuttings placed in the solution, while a solution approximately twice as strong as that required to produce a gas concentration fatal to flies had no effect even upon seedlings.

"Sodium cyanid solutions introduced into the soil failed to give a trace of hydrocyanic acid gas in air drawn from the soil. The use of pressure in

forcing gas into the soil did not materially increase the rate at which it could be introduced. Soil and water are both strong absorbents of hydrocyanic acid gas. Retention of hydrocyanic acid gas by the soil is dependent upon the character of the soil, while that of water remains constant under uniform conditions of pressure and temperature.

"The variability of gas absorption by the soil makes it practically impossible in field work to estimate the dosage of sodium cyanid required to give a toxic effect on insects and at the same time to be within the margin of safety to plants. In small amounts of soil of a uniform character it is possible to determine experimentally the margin of safety between certain insects and plants. A heavy damp or a very wet sandy soil is almost impervious to hydrocyanic acid gas. A pure sandy soil when wet will take up hydrocyanic acid gas only in proportion to the amount of water present and this may again be given off, but gas in contact with a clay soil either enters into a chemical combination with some of the soil constituents or is adsorbed by the soil particles. Gas generated in a soil body diffuses with extreme slowness in clay soils or very wet sandy soils, but in sand with a medium amount of moisture, the diffusion of gas is much more rapid. The use of sodium cyanid offers a satisfactory means of fumigating masses of loose, porous soil, especially those with only small amounts of clay, or of seed beds and potting soil. Such treatments allow of much wider range of concentrations when the soil is not occupied by a crop."

Ventilation after fumigation.—Artificial ventilation of ships after fumigation with hydrocyanic acid gas, S. B. GRUBBS (*Pub. Health Rpts.* [*U. S.*], *32* (*1917*), *No. 42, pp. 1757–1761, pls. 2*).—"Quarantine stations at which hydrocyanic acid gas fumigation is practiced should be equipped with mechanical means for artificial ventilation. The gasoline-driven fan as adapted for this use is satisfactory for the prompt ventilation of compartments of vessels after fumigation. For the expeditious handling of large vessels three machines are recommended, two of the horizontal pattern (downward thrust) and one of the vertical pattern (horizontal thrust)."

Fumigation hints (*Cal. Citrogr.*, *2* (*1917*), *No. 12, p. 4*).—This is a summary of recommendations made by R. S. Woglum of the U. S. Department of Agriculture relative to the injury by and dosage of hydrocyanic acid gas in fumigation work with citrus. Attention is called to the fact that trees, the branches of which have been sprayed with Bordeaux mixture or painted with Bordeaux paste, should not be fumigated since it will result in a serious burning. Trees sprayed with lime-sulphur are unaffected by fumigation, as is the case with trees of which the trunk alone has been treated with Bordeaux.

Effect of smelter gases on insects, R. W. DOANE (*Science, n. ser.*, *46* (*1917*), *No. 1186, pp. 295, 296*).—During the course of several summers spent in studying insects in regions where smelters are located, the author has detected no differences in the number of insects or the extent of insect injury due to the presence of smelter gases. Fumigation tests with sulphur dioxid in strengths of from 5 to 25 parts to 1,000,000 parts of air failed to demonstrate an insecticidal effect, and he concludes that the sulphur dioxid given off by the smelters has no effect whatever on the insects in that region.

The natural immunity or resistance of plants to insect attack, R. C. TREHERNE (*Agr. Gaz. Canada*, *4* (*1917*), *No. 10, pp. 855–859*).—A general discussion of this subject.

Some problems of sex ratios and parthenogenesis, C. B. WILLIAMS (*Jour. Genetics*, *6* (*1917*), *No. 4, pp. 255–267, figs. 5*).—"*Aleyrodes vaporariorum* has two races, one of which, found in England, produces females parthenogenetic-

ally; the other, found in the United States, produces males. A colony of what is apparently the male-producing race has been found in England. Fertilized eggs give an equality of the two sexes."

Ninth annual report of the Quebec Society for the Protection of Plants from Insects and Fungus Diseases, 1916–17 (*Ann. Rpt. Quebec Soc. Protec. Plants* [*etc.*], *9* (*1916–17*), *pp. 145, figs. 49*).—Among the papers presented in this, the usual annual report (E. S. R., 37, p. 156), are the following: Masterpieces of American Economic Entomology, by W. Lochhead (pp. 12–18); A Few Notes on the "Pear Tree Slug," by J. C. Chapais (pp. 25–27); Carriers and Diluents for Dusting, by C. E. Petch (pp. 28, 29); Cabbage Insects, by A. Gibson (pp. 30–41); What Insecticides and Fungicides Shall We Use in 1917, and When Shall We Spray This Year? by Father Leopold (pp. 42–44); Historical Notes on Entomology in the Province of Quebec, by V. A. Huard (pp. 54–59); The White Pine Weevil, *Pissodes strobi*, in Quebec, by J. M. Swaine (pp. 60–64); Two Destructive Shade Tree Borers (*Cyllene robiniæ* and *Agrilus anxius*), by C. B. Hutchings (pp. 65–70); The Commoner Grass Moths of Quebec, by J. A. Corcoran (pp. 71–77); Animal Parasites and Rural Sanitation, by W. A. Riley (pp. 99–109); The Eye-Spotted Bud Moth, by E. M. DuPorte (pp. 118–137); and Near Relatives of Insects Injurious to Plants and Animals, by W. Lochhead (pp. 138–144).

Report of the Dominion entomologist for the year ended March 31, 1915, C. G. HEWITT (*Canada Dept. Agr., Rpt. Dominion Ent., 1915, pp. 40, pl. 1, figs. 6*).—This reports briefly the work of the year under the headings of administration of the Destructive Insect and Pest Act, and insects affecting cereals and other field crops, fruit crops, forest and shade trees, domestic animals and man, and the garden and greenhouse. A map showing the distribution of the brown-tail and gipsy moths in 1914 and the places in Canada where parasites and predacious beetles have been distributed to date is appended.

Annual report of the entomologist, A. H. RITCHIE (*Ann. Rpt. Dept. Agr. Jamaica, 1917, pp. 28–34; abs. in Agr. News* [*Barbados*], *16* (*1917*), *Nos. 401, pp. 282, 283; 402, pp. 298, 299*).—The occurrence of the more important insects of the year ended March 31, 1917, is reported upon under the headings of sugar cane, coconut, citrus, pimento, pineapple, storage, corn, truck crop, stock pests, etc.

The West Indian sugar cane leaf hopper (*Stenocranus saccharivorus*) was the most important cane pest worked with. Two new host plants, the mahwa tree (*Bassia latifolia*) and the wampee (*Clausenia wampi*), are recorded for the spiny white fly (*Aleurocanthus woglumi*), which has spread throughout Jamaica since its discovery in 1913 and is a most serious pest of citrus.

Insect pests in British Guiana in 1916, H. W. B. MOORE (*Abs. in Agr. News* [*Barbados*], *16* (*1917*), *No. 400, pp. 266, 267*).—A small undetermined pyralid moth borer of the subfamily Phycitinæ, discovered in 1916 and apparently new to science, has a wide distribution in British Guiana. The shoot is attacked in a manner quite different from that by the other small borers. As a rule it bores straight to the heart and then merely eats out a small cavity instead of making a longitudinal tunnel. Notes are given on the small moth borers (*Diatræa saccharalis* and *D. canella*), which do considerable damage, the large moth borer (*Castnia licus*), the small black hardback (*Dyscinetus bidentatus*), the froghopper (*Tomaspis flavilatera*), etc.

A summary of the work of the pest control section for the year 1916, D. B. MACKIE (*Philippine Agr. Rev.* [*English Ed.*], *10* (*1917*), *No. 2, pp. 128–145, pls. 3*).—This summary records the work in the locust campaign, with diseases and pests of coconut palms, the control of the tobacco beetle, sugar

cane pests, pests of abaca, insects affecting rice, and diseases and insect pests of citrus trees, educational propaganda in connection with pest control, and work in apiculture with *Apis mellifica*, *A. indica*, and *A. dorsata*.

[Insects of economic importance in Great Britain] (*Ann. Appl. Biol., 4 (1917), No. 1–2, pp. 1–14, 28–46, 75–90, figs. 5*).—The papers here presented include the following: Frit Fly (*Oscinus frit*) Attacking Winter Wheat, by F. R. Petherbridge (pp. 1–3); Some Farm Insects Observed in the Aberystwith Area, 1913–1916, by C. L. Walton (pp. 4–14); The Life History and Economy of the Cheese Mites, by Nellie B. Eales (pp. 28–35); Investigation of Bulb Rot of Narcissus.—I, The Nature of the Disease, Due to *Tylenchus devastatrix*, by E. J. Welsford (pp. 36–46); and A List of Coccidæ Affecting Various Genera of Plants (pp. 75–89), and a Note on the Immunity of Chalcid Parasites to Hydrocyanic Acid Gas (p. 90), by E. E. Green.

[Insects of economic importance in Italy] (*Redia, 12 (1917), No. 1–2, pp. 1–359, pls. 5, figs. 17*).—The papers here presented include the following: Aspidiotiphagus and Prospaltella, by A. Berlese (pp. 1–13); A Case of Endophagy of *Aspidiotiphagus citrinus* on *Chrysomphalus dictyospermi*, by E. Malenotti (pp. 15–18); First Century of New Acarids, by A. Berlese (pp. 19–67); A Second Series of Experiments on the Influence of Some Chemicals on *Bombyx mori*, by C. Cavazza (pp. 69–108); On the Variation in *C. dictyospermi*, by E. Malenotti (pp. 109–123); Second Century of New Acarids (pp. 125–177) and *Scutellista gigantea* n. sp. (pp. 179, 180), by A. Berlese; *Signiphora merceti* n. sp. (pp. 181, 182), New Diaspinæ (pp. 183–194), and *Prospaltella fasciata* n. sp. (pp. 195, 196), by E. Malenotti; Contribution to the Knowledge of the Aphididæ, by G. del Guercio (pp. 197–277); Orthoptera Collected in Southern Italian Somali, by E. Giglio-Tos (pp. 279–287); Third Century of New Acarids, by A. Berlese (pp. 289–338); *Metalaptus torquatus*, a New Genus and Species of Chalcididæ, by E. Malenotti (pp. 339–341); and Revision of the Genus Hydrozetes, by L. Chinaglia (pp. 343–359).

[Insect pests in the Federated Malay States] (*Agr. Bul. Fed. Malay States, 5 (1917), No. 8–9, pp. 327–357*).—The Diseases and Pests of the Coconut Palm are discussed by R. M. Richards (pp. 327–337); The History and Present Position of White Ant Treatment in the Malay Peninsula, by P. B. Richards, acting government entomologist (pp. 338–348); and the Application of the Agricultural Pests Enactment, by F. W. South, chief agricultural inspector (pp. 349–357).

Some important insect pests of cotton in the Punjab, Madan Mohan Lall (*Lahore, Punjab: Dept. Agr., 1917, pp. [8], pls. 3*).—Brief descriptions are given of three of the most injurious pests of cotton in the Punjab, namely, a cotton bollworm, the red cotton bug, and the dusky cotton bug, including colored plates of each, showing the various stages and the nature of injury.

Insects attacking fruit trees, L. Caesar (*Ontario Dept. Agr. Bul. 250 (1917), pp. 55, figs. 59*).—A summarized account is given of the more important insect pests attacking fruit trees and means for their control, under the headings of insects attacking the apple, pear, plum, cherry, and peach.

The insects which attack the wood of fruit trees, P. Lesne (*Rev. Hort. [Paris], 89 (1917), No. 19, pp. 300–302, pl. 1*).—This brief account is accompanied by a colored plate illustrating several of the important wood-attacking species of Coleoptera and Lepidoptera and the nature of their work.

Cranberry insect problems and suggestions for solving them, H. B. Scammell (*U. S. Dept. Agr., Farmers' Bul. 860 (1917), pp. 42, figs. 38*).—This publication, which supersedes Farmers' Bulletin 178 (E. S. R., 15, p. 381), gives a popular summary of the present status of the knowledge of cranberry insects and means for their control.

Some insects injurious to cacao plants in the Belgian Kongo (*Bul. Ent. Research, 8 (1917), No. 1, pp. 111–118, figs. 3*).—The present paper consists of descriptions of a number of species new to science, collected by the government entomologist in the Belgian Kongo, R. Mayné.

[Report of the entomologist], E. A. Andrews (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 2 (1916), pp. 81, 82, 87, 88*).—Mention is made of the more serious pests of tea.

A preliminary list of the insects of the Province of Quebec, III, G. Chagnon (*Ann. Rpt. Quebec Soc. Protec. Plants [etc.], 9 (1916–17), Sup., pp. 161–277*).—This third part (E. S. R., 34, p. 449) lists 1,810 species of Coleoptera as occurring in the Province of Quebec.

Report on a collection of termites from India, Karin and N. Holmgren, trans. by T. B. Fletcher (*Mem. Dept. Agr. India, Ent. Ser., 5 (1917), No. 3, pp. 133–171, fig. 1*).—This systematic account, based upon collections made in diverse parts of India by T. B. Fletcher, includes descriptions of a large number of new species, one new genus, and one new subfamily.

The second experimental campaign for the destruction of locusts in Morocco by means of d'Herelle's method, H. Velu (*Ann. Inst. Pasteur, 31 (1917), No. 6, pp. 277–290; abs. in Trop. Vet. Bul., 5 (1917), No. 3, pp. 210, 211*).—This reports upon the results of work carried on from March to July, 1916, in continuation of that previously noted (E. S. R., 36, p. 857).

A new thrips damaging orchids in the West Indies, C. B. Williams (*Bul. Ent. Research, 8 (1917), No. 1, pp. 59–61, fig. 1*).—Under the name *Physothrips xanthius* the author describes a new thrips which has recently caused much damage to orchids grown for ornamental purposes in Trinidad.

Observations on the cotton stainer in St. Vincent, W. N. Sands (*West Indian Bul., 16 (1917), No. 3, pp. 235–252, pls. 2, fig. 1; abs. in Agr. News [Barbados], 16 (1917), No. 403, pp. 308, 309*).—A report of studies of the life history and habits and of control measures for *Dysdercus delauneyi* (E. S. R., 36, p. 654).

Trapping of the cotton stainer (*Agr. News [Barbados], 16 (1917), No. 400, p. 267*).—A brief report of experiments in the trapping and destruction of the cotton stainer (*Dysdercus delauncyi*) in the field in St. Vincent. The cotton stainers are attracted to traps of cotton seed, placed under cacao trees surrounding silk cotton trees that have been destroyed when heavily infested with the cotton stainer, and killed by means of a gasoline torch without destroying the effectiveness or attractiveness of the bait of the traps.

A revision of the genus Lygus as it occurs in America north of Mexico, with biological data on the species from New York, H. H. Knight (*New York Cornell Sta. Bul. 391 (1917), pp. 557–645, pl. 1, figs. 55*).—In this revision the author recognizes 67 forms of Lygus of which 28 species occur in New York State and 9 occur in neighboring States which will doubtless soon be found within New York borders. Thirty-four species and 11 varieties are described as new. "Food plants and other biological data are given for all but one of the species known to occur in this State. The present paper gives a much-needed systematic revision of the group; but the most important feature is that structural characters found in the male genital claspers have been worked out and shown to furnish a reliable criterion for recognition of the species."

A bibliography of five pages is included.

The Derbidæ of the Philippine Islands, F. Muir (*Philippine Jour. Sci., Sect. D, 12 (1917), No. 2, pp. 49–105, pl. 1, figs. 4*).—Ninety-eight species representing 39 genera of this family of Hemiptera are described from the Philippines, of which 7 genera and 61 species are new.

Biology of the Membracidæ of the Cayuga Lake Basin, W. D. FUNKHOUSER (*New York Cornell Sta. Mem. 11 (1917), pp. 181–445, figs. 331*).—This memoir reports investigations made of 61 species of membracids representing 21 genera belonging to three subfamilies, found particularly in the vicinity of Ithaca, N. Y. Keys are given to the genera and species with technical descriptions and brief accounts of their life histories, an account of the external and internal anatomy of the Membracidæ, etc. Among the subjects discussed are the geography and physiography of the Cayuga Lake Basin, climatology of the basin, the basin as a floral and faunal area, distribution and range of the family, a comparison of Cayuga Lake Basin with the State as a whole, theories of origin and paths of migration, hosts, migrations, habits, attendance by ants, communal life, ecology, natural enemies, economic importance, methods of collecting and preserving, etc. A check-list of the genera and species and a 12-page bibliography are included.

The Indian sugar cane leaf hopper (Pyrilla aberrans), C. S. MISRA (*Mem. Dept. Agr. India, Ent. Ser., 5 (1917), No. 2, pp. 73–136, pls. 11, figs. 9*).—This is an extended report of studies of a fulgorid which first came to attention in 1905, during which year it appeared in large numbers in the experimental series of canes at Pusa. Since that time it has been a source of serious injury to cane in 1906, 1907, 1910, and 1914. Three chalcidids, two of which have been determined as *Ooencyrtus pyrillæ* and *Tetrastichus pyrillæ*, two dryinids, *Dryinus pyrillæ* and *Chlorodryinus pallidus*, and a stylopid, *Pyrilloxenos compactus*, are recorded as parasites. An extended account of studies of the biology of *C. pallidus* is given.

The correct name for our apple-grain aphis, A. C. BAKER (*Science, n. ser., 46 (1917), No. 1191, pp. 410, 411*).—This is a brief discussion in which the author shows that more than one species of plant lice occurs upon grains and grasses under the name *Aphis avenæ* Fab.; that the one of these species which migrates to apple and related trees where the eggs are laid, must be known as *A. prunifoliæ* Fitch; that another species, the oat aphis, which migrates to bird cherries in Europe, must be known as *A. padi* L., of which *A. avenæ* Fab. is a synonym; that the species now known as *A. cerasifoliæ* Fitch migrates to grains and grasses as does *A. padi* and is possibly the same species; and that the present placing of the name "*prunifoliæ*" as a synonym of "*cardui* L." is not correct.

The pink and green aphid of potato, Macrosiphum solanifolii, J. S. HOUSER, T. L. GUYTON, and P. R. LOWRY (*Ohio Sta. Bul. 317 (1917), pp. 61–88, figs. 22*).—This summary of information on *M. solanifolii*, its life history and habits, host plants, nature and extent of injury, natural enemies, and control measures based upon investigations carried on during 1917, is a much more detailed account than that previously noted (E. S. R., 37, p. 849). In the course of the discussion reference is made to the investigation of this aphid at the Maine Station, reports of which by Patch have been previously noted (E. S. R., 19, p. 662; 25, p. 759).

It is stated that while the greatest injury to potatoes during the season was caused by this plant louse, another species, *Myzus persicæ*, did some damage to potatoes, having been taken at Batavia, Liberty Center, Celina, and Canton, Ohio. A small potato plat was killed outright at Canton.

The insect hibernates as a shiny black egg, probably more frequently on the rose than on any other host. With the coming of summer the eggs hatch into agamic viviparous females, some of which acquire wings and fly to the potato, where they start the series of generations of agamic viviparous females. About 10 days are required for the daughters to become full-grown and begin

producing young, hence there are many generations during the summer breeding season. The last brood of summer females produces a generation of winged males and wingless females by which the overwintering egg is deposited. At first this egg is greenish but in a few days becomes jet black.

The adults of this species are somewhat more restless than most other aphids and migrate freely from one place to another, thus field-sprayed plants are highly subject to reinfestation. It is pointed out that the matter of reinfestation of plants by migrants should receive careful consideration when control measures are being planned.

In recording its host plants the authors have limited their records to those upon which the female aphid was found producing young. Those heavily infested include the potato, tomato, eggplant, pepper, and sunflower. Those commonly but not heavily infested include the jimson weed, ragweed, lamb's-quarter, sweet potato, canna, hollyhock, and matrimony vine. The hosts not commonly infested include corn, beans, moth mullen, plantain, curly dock, smartweed, shepherd's purse, catalpa shoots, ground cherry, and pokeweed. In addition to these Patch has recorded it on *Iris* sp., *Gladiolus* sp., red root pigweed, turnip, garden pea, apple, pepper vine, cultivated aster, cineraria, and *Lactuca* sp. Thus it appears to be a cosmopolitan feeder, which complicates its control.

Four species of hymenopterous parasites, namely, *Aphidius polygonaphis*, *Pachyneuron aphidvorum*, and two species of Lygocerus are said to have been remarkably abundant. Nine species of lady beetles in the adult stage were observed feeding upon the aphids, of which *Hippodamia convergens* was the most common and *Coccinella 9-notata* second in importance. The larvæ of three species of Syrphus flies were found commonly feeding upon the aphids, namely, *Syrphus americanus*, *Sphaerophoria cylindrica*, and *Allograpta obliqua*. The chipping sparrow, quail, English sparrow, and domestic fowl were observed actively feeding upon plant lice, and a fungus (*Empusa* sp.) was of considerable importance in reducing their numbers.

Control work of the year led to the conclusion that nicotin sulphate, 1.5 to 2 teaspoonfuls to a gallon of water, or about 1:500, with enough soap added to form a suds is the most satisfactory spraying material for the control of this species. Two applications or more may be necessary to control the pest and these applications under conditions such as prevailed during 1917 should not be more than three days apart. Both spraying in the early stages of an outbreak and thoroughness of application are essential to the successful control. Because of the wide range of host plants, clean culture is an important adjunct to control measures. It is stated that with proper equipment, proper material, and thorough work this potato pest may be effectively and economically controlled.

A list of the Aphididæ of Japan, with description of new species and genera, S. Matsumura (*Jour. Col. Agr. Tohoku Imp. Univ., 7 (1917), No. 6, pp. 351–414, pls. 2*).—The present list contains 81 species representing 29 genera, among which 57 species and 15 genera are described as new to science.

Contribution to the knowledge of the Aphididæ, G. del Guercio (*Redia, 12 (1917), No. 1–2, pp. 197–277, pls. 3; abs. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 7, pp. 334, 335*).—This paper deals with the classification of 22 species of aphids occurring in Europe, Africa, and America, many of which are of economic importance while others are new or insufficiently described.

Francoa elegans n. g. and n. sp., which occurs on roses in Italy, was the source of more injury than *Macrosiphum rosæ* or *Myzus rosarum* when observed in June. The black peach aphis has been observed in Italy on peaches

of American origin and the injury caused is quite as severe as in the United States. The species infesting Italian Graminaceæ and citrus plants are noted. The concluding part of the paper reports upon preliminary studies made of several root aphids, namely, *Neorhizobius ulmiphilus* n. sp. on *Ulmus americana* and *U. campestris*; *N. poæ* n. sp. on grasses; *N. stramineus* n. sp. on barley; (*Schizoneura*) *Eriosoma ulmi* on currant and gooseberry; and the woolly apple aphis. In the course of three years' experiments the author has failed to demonstrate that the spring alates of the woolly apple aphis migrate from the elm to the apple.

The coccid enemies of the vine in Hungary, J. JABLONOWSKI (*Kisérlet. Közlem., 19 (1916), No. 2, pp. 169–288, pls. 8, figs. 22; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 2, pp. 316, 317*).—Six species which infest other agricultural plants are said to be of importance as enemies of the vine in Hungary, namely, *Phenacoccus aceris*, *Pseudococcus adonidum*, *P. citri*, *Pulvinaria betulæ*, *Eulecanium corni*, and *E. persicæ*.

Coccidæ of the Philippine Islands, ELIZABETH ROBINSON (*Philippine Jour. Sci., Sect. D, 12 (1917), No. 1, pp. 47, pls. 6*).—The author records 73 species representing 25 genera from the Philippines, of which 4 species are described as new. A host index is appended.

Orchard injury by the hickory tiger-moth, D. ISELY (*U. S. Dept. Agr. Bul. 598 (1918), pp. 14, pls. 3*).—The present paper is based upon investigations of *Halisidota caryæ* at North East, Pa., during the seasons of 1914, 1915, and 1916. This gregarious summer caterpillar, although a general feeder on deciduous trees and shrubs, causes occasional injury in orchards of pomaceous fruits and cultivated walnuts. The species was first described by Harris in 1841, since which time many complaints have been made of its injury although there appear to be no records of very great destructiveness. It is pointed out by the author that the hickory tiger-moth is the common name which should be applied to this insect since it belongs to the tiger-moth and not to the tussock-moth family. It is distributed over the northeastern United States and the adjacent Canadian Provinces, ranging from the Atlantic Ocean west to Missouri, Minnesota, and Saskatchewan and south to North Carolina and southern Ohio.

Technical descriptions are given of its life stages, including nine larval instars. Forty-nine host plants are listed for the nearly mature larva, but the number of food plants upon which the larva can develop from egg to pupa is much smaller and appears to be restricted to trees of the walnut and hickory family and to pomaceous fruits. The author has reared larvæ from egg to pupa on Japanese walnut, English walnut, black walnut, apple, and pear.

There is but one generation annually. Pupation takes place in the fall, the winter being passed in the pupal stage on the ground and the moths emerging in the early summer, apparently as early as the first of June. From 15 to 16 days are required for the egg stage. The duration of the larval feeding period varies greatly and the number of instars varies from 7 to 9. Larvæ reared by the author on Japanese walnut in 1915 required from 62 to 85 days from egg to cocoon, with an average of 74.73 days, while in 1916 on the same food plant from 80 to 100 days, with an average of 89.04 days, were required. This variation is thought to have been influenced to some extent by the considerable difference in the amount of rainfall, there having been an excessive rainfall in 1915. The minimum period required for the development from egg to cocoon was 89 days and the longest 96 days, with an average of 92.87 days. The larvæ are gregarious in the early stages and even in the later stages molt together. They begin to scatter the latter part of the fourth stage.

The species is remarkably free from parasitic enemies, *Pimpla pedalis* being the only one recorded. While the injury by this pest is intensive and not extensive, it is due to the gregarious larvæ of the early stages which strip branches and sometimes small trees of their foliage and the injury to young trees may be quite severe. It may be controlled readily by spraying with arsenicals; orchards which have been thoroughly sprayed for the codling moth have never been observed to be infested. The caterpillars soon become very hard to poison and large amounts are required to kill them in the later stages.

A list of 19 references to the literature is appended.

The quince borer and its control, F. W. PETTEY (*Union So. Africa Dept. Agr.* [*Pub.*] *2* (*1917*), *pp. 17, figs. 10*).—A detailed account of *Coryphodema tristis*, a lepidopteran of the family Cossidæ, which is distributed all over Cape Province wherever quinces or Wemmershoek apples are grown, but which is not known to occur in any other country. Serious damage is done by killing the branches infested by it or by impairing the bearing capacity of the whole or of parts of the tree.

Moth borers affecting sugar cane in Mauritius, D. D'EMMEREZ DE CHARMOY (*Dept. Agr. Mauritius, Sci. Ser. Bul. 5* (*1917*), [*English Ed.*], *pp. 27, pls. 7*).—Summarized accounts are given of the pink borer (*Sesamia vuteria*), the spotted borer (*Proceras sacchariphaga*), the white borer (*Grapholita schistaceana*), and the brown borer (*Alucita sacchari*). Descriptions of parasites of these species are appended.

The sweet potato leaf-folder, T. H. JONES (*U. S. Dept. Agr. Bul. 609* (*1917*), *pp. 12, figs. 4*).—This is a report of studies at Baton Rouge, La., of the pyralid moth *Pilocrocis tripunctata*, the larva of which was first observed to be an enemy of sweet potatoes in Louisiana in 1914. While it has not as yet been observed to occur in destructive abundance in that State, it was very injurious to the sweet potato near Brownsville, Tex., during the fall of 1916, where control experiments with poisons were conducted by M. M. High, a complementary report of which is incorporated in this account.

In addition to Louisiana and Texas the species is recorded from Mexico, Jamaica, Cuba, and Grenada, West Indies, and has previously been observed by the author on sweet potatoes in Porto Rico (E. S. R., 33, p. 59).

Technical descriptions are given of its several stages. In addition to the sweet potato the moth has been reared from larvæ found feeding on uncultivated plants of the genus Ipomœa, such as bindweed, wild sweet potato, and wild morning-glory.

At Baton Rouge during the latter part of July and first of August four days are required for the incubation of the egg. In the field the larvæ are found between separate leaves or portions of the same leaf which have been fastened together to form "shelters," each of which usually protects one larva. While the number of larval molts varies, there are usually six, for the development of which 3 days are required for the first instar, 2 days each for the second, third, fourth, and fifth instars, and 5 days for the sixth instar. In the field and in the insectary the pupæ normally are found in loose cocoons within the shelters made by the larvæ, from 6 to 9 days being required for their development. Hibernation appears to take place in the larval stage. The minimum period required for the various stages at Baton Rouge are egg stage 4 days, larval stages 13 days, prepupal stage 2 days, and pupal stage 6 days, or a total of 25 days.

The tachinid fly *Exorista pyste* and an ichneumonid (*Bassus* sp.) have been reared from collections of larvæ made in the field at Baton Rouge. Spraying experiments reported indicate that the larvæ can be killed readily by timely

applications of arsenical sprays, either arsenate of lead or zinc arsenite at the rate of 1 or 2 lbs. (powder) to 50 gal. of water.

Results obtained from spraying raspberries with carbolineum for (Lampronia) Incurvaria rubiella, K. Onrust (*Tijdschr. Plantenziekten, 23 (1917), No. 1, pp. 17–30; abs. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 7, p. 277*).—Spraying with carbolineum or banding with adhesive has been found to be the best measure for controlling infestation by this tineid moth borer, which sometimes infests the raspberry in the Netherlands to the extent of 50 per cent. An 8 per cent strength of carbolineum should be applied to the foliage and roots before March 15.

The toxin of Sotto bacilli, K. Aoki and Y. Chigasaki (*Bul. Assoc. Séri. Japon, Nos. 20 (1916), pp. 1–6; 21 (1917), pp. 1–8*).—These data supplement the accounts previously noted (E. S. R., 37, p. 853). The toxin of the Sotto bacillus largely remains fixed within the organism; it does not pass through the porcelain filter and disappears after boiling for 10 minutes. The spores are destroyed and the toxin neutralized by Lugol's solution.

Studies in Philippine Diptera, I and II, M. Bezzi (*Philippine Jour. Sci., Sect. D, 8 (1913), No. 4, pp. 305–332; 12 (1917), No. 3, pp. 107–161, pl. 1*).—A catalogue of Diptera hitherto recorded from the Philippine Islands is first presented, followed by descriptive notes on 200 forms. In the first and second papers, respectively, 2 genera and 17 species and 2 genera and 34 species are described as new.

The Hessian fly, E. N. Cory (*Md. Agr. Ext. Serv. Bul. 7 (1917), pp. 4, fig. 1*).—A summary of information on this pest, including a diagram of its seasonal development and the planting dates between which it is safe to sow wheat in various parts of Maryland.

Sheep maggot flies, III, W. W. and J. L. Froggatt (*Dept. Agr. N. S. Wales, Farmers' Bul. 113 (1917), pp. 37, figs. 12*).—This report of work, carried on during 1915–16 in continuation of that previously noted (E. S. R., 37, p. 160), deals with the reduction of flies by destruction of offal and carrion, trapping flies, blow flies breeding in decaying vegetable matter, baits for attracting and poisoning maggots and adult flies, tests with dips and dressings, chemical notes, dipping and spraying, rendering sheep immune by internal drenches or licks, notes on destruction of birds, and climatic conditions that seem to suit sheep maggot flies in the Riverina. In the first of two appendixes (pp. 27–33) the parasites of the sheep maggot flies, including *Nasonia brevicornis* which has been reared and distributed all over New South Wales, *Chalcis calliphoræ* (E. S. R., 36, p. 360), and an undetermined parasite of the shining black fly (*Ophyra nigra*), are dealt with. Appendix 2 (pp. 34–37) discusses an amended classification of the sheep maggot flies dealt with in these reports, with some account of their identification.

Life history, habits, natural enemies, and methods of control of the currant fruit fly (Epochra canadensis), H. H. P. Severin (*Maine Sta. Bul. 264 (1917), pp. 177–247, pls. 4, figs. 7*).—This is a summary of the present status of knowledge of the currant fruit fly, based upon a review of the literature and investigations conducted by the author in Maine. Following a brief introduction the subject is dealt with at length under the headings of systematic position, distribution and destructiveness, life history, habits and behavior of adults, natural enemies, and methods of control. A bibliography of 62 titles and an index are included.

The species appears to be confined to North America; in Canada, it is distributed principally in the Canadian zone as far north as Edmonton, Alberta; and in the United States it occurs in the Canadian, Transition, and Upper Aus-

tral zones. Wild currants and gooseberries appear to be the native host plants of the species, which is so serious a pest in Maine that frequently the crop of currants and gooseberries is a total loss. The author found the life stages under field and laboratory conditions to vary in 1914 and 1915 as follows: The egg period from 4 to 8 days, larval period from 10 to 25 days, pupal period from 10 to 11 months, mating period from 29 to 38 days, preoviposition period from 6 to 16 days, egg-laying period from 34 to 36 days, and longevity of adults from 29 to 31 days.

In control work the employment of sweetened arsenical sprays appears to have given the most satisfactory results. The author summarizes these results as follows: "In 1914, the results of spraying the foliage with arsenate of lead added to diluted molasses [arsenate of lead 3 oz., molasses 1 gal., and water 2 gal.] showed a loss of 24 per cent of the crop of gooseberries in a commercial garden consisting of 100 currant and gooseberry bushes. In three adjacent dooryards 41, 55, and 64 per cent of the gooseberries were infested. The cost of the insecticide for eight applications of the spray to 100 bushes not including labor amounted to 65 cts. In 1915, a baited gooseberry bush growing in the shade showed a loss of 33 per cent of the berries compared with 79 per cent of infested fruit on the check or control bush similarly located, while a treated and untreated gooseberry bush in the sunshine showed an infestation of 17 per cent and 29 per cent, respectively. The poisoned bait, consisting of sodium arsenite and diluted molasses, was applied to the lower branches of the bushes with a bucket pump, while the upper branches were baited with a paint brush. The cost of four baitings applied to 35 currant and gooseberry bushes without labor amounted to 57.5 cts."

The sweet potato root weevil in Florida, K. E. Bragdon (*Fla. Buggist, 1 (1917), No. 2, pp. 13–15*).—A brief account of *Cylas formicarius*, which has been found in eight counties of Florida, namely, Baker, Brevard, St. Lucie, Palm Beach, Broward, Dade, Monroe, and Lee.

Five years of starvation of larvæ, J. E. Wodsedalek (*Science, n. ser., 46 (1917), No. 1189, pp. 366, 367*).—This paper relates to the larvæ of *Trogoderma tarsale*, a small beetle well known as a museum pest. The last of a large number of specimens lived without food for 5 years, 1 month, and 29 days.

The relation of the Malpighian tubules of the hind intestine in the honeybee larva, J. A. Nelson (*Science, n. ser., 46 (1917), No. 1188, pp. 343–345*).

A new species of Paraphelinus from British Guiana, with a discussion of the genus and the allied Aphelinus, J. Waterston (*Bul. Ent. Research, 8 (1917), No. 1, pp. 43–58, figs. 6*).—The genus Paraphelinus represented by five species, including *P. perkinsi* n. sp., is considered at some length.

Notes relative to the importation of Tiphia parallela from Barbados to Mauritius for the control of Phytalus smithi, D. d'Emmerez de Charmoy (*Bul. Ent. Research, 8 (1917), No. 1, pp. 93–102, fig. 1*).—An account of introductory work which has resulted in the establishment of *T. parallela* in Mauritius.

The parasites of Chrysomphalus dictyospermi in Spain, R. G. Mercet (*Rev. R. Acad. Cien. Madrid, 14 (1916), No. 11, pp. 776–788, figs. 5; abs. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 7, p. 279*).—A species here described as new under the name *Aphycus hesperidum* is parasitic on *C. dictyospermi* on orange trees, laureds, and oleanders in Spain. Two other parasites, *Aphelinus chrysomphali*, and *Prospaltella lounsburyi*, and a lady beetle (*Chilocorus bipustulatus*) are also recorded as enemies of this scale in Spain.

Further experiments on big bud mite, A. H. Lees (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1915, pp. 79, 80; 1916, p. 35*).—In the control of this mite a spray containing 10 per cent soft soap and 5 per cent crude carbolic acid has proved to be the most successful.

The classification and biology of Argentine Ixodidæ, R. Dios (*An. Soc. Rural Argentina, 51 (1917), No. 3, pp. 249–251, figs. 2*).—In this contribution the new species *Amblyomma altiplanum* is described.

The ticks in Paraguay, P. de la O. Mendoza (*An. Soc. Rural Argentina, 51 (1917), No. 3, pp. 251–253*).—A brief discussion of the economic importance of ticks in Paraguay.

FOODS—HUMAN NUTRITION.

The elements of the science of nutrition, G. Lusk (*Philadelphia and London: W. B. Saunders Co., 1917, 3. ed. rev. and enl., pp. 641, pls. 2, figs. 26*).—This book has the same aim as the earlier edition of which it is a revision (E. S. R., 22, p. 568), but many important additions to the facts of metabolism and revisions of its theories have been included. The concluding chapter deals with the question of food economics in relation to the food supply of nations.

The bowfin: An old-fashioned fish with a new-found use (*U. S. Dept. Com., Bur. Fisheries Econ. Circ. 26 (1917), pp. 4, fig. 1*).—This circular discusses the bowfin—its habitat, and its use as a food. Methods of cleaning and smoking bowfin are given, also a few recipes for preparing the smoked bowfin for the table.

The burbot: A fresh-water cousin to the cod (*U. S. Dept. Com., Bur. Fisheries Econ. Circ. 25 (1917), pp. 4, fig. 1*).—A popular treatise on the uses of the burbot for food. Some recipes are given.

The eulachon: A rich and delicious little fish (*U. S. Dept. Com., Bur. Fisheries Econ. Circ. 33 (1917), pp. 4, fig. 1*).—This tells of a good fish not well-known to the public and gives ways of preparing it for the table.

The whiting: A good fish not adequately utilized (*U. S. Dept. Com., Bur. Fisheries Econ. Circ. 32 (1917), pp. 4, fig. 1*).—The article urges an increased use of the whiting, which is a delicate fish obtainable in large quantities. Recipes for its preparation are given.

Preserving fish for domestic use (*U. S. Dept. Com., Bur. Fisheries Econ. Circ. 28 (1917), pp. 2*).—This leaflet urges housewives living near streams and lakes or the seashore to preserve fish for home consumption. Methods for canning and salting fish are given.

The digestibility of the dasheen, C. F. Langworthy and A. D. Holmes (*U. S. Dept. Agr. Bul. 612 (1917), pp. 12*).—In digestion experiments lasting three days on normal men, using immature and mature dasheens in conjunction with milk, fruit, and butter, with tea or coffee, if desired, it was found that the average coefficients of digestibility for the total diet were protein 80.8, fat 96.1, ash 78.4, and carbohydrates 97.6 per cent. The last figure practically represented the digestibility of the dasheen carbohydrate, and it appeared to be immaterial whether the well-grown dasheen was mature or immature when harvested.

About 1¼ lbs. of dasheens were eaten by the subjects daily without any observed physiological disturbances. It is concluded that the dasheen is a valuable addition to the dietary and can well be used to supplement the potato supply and give variety.

The thermal death point in yeast, E. P. Wells (*Vermont Sta. Bul. 203 (1917), pp. 13, 14*).—Experiments made with the yeast *Saccharomyces cerevisiæ* to determine its thermal death point (the lowest temperature that will kill it

in ten minutes) brought out that this point is raised with the addition of sugars or colloids, such as starch.

Living yeast cells were found in loaves baked at 66° C. or less, but none in loaves baked at 68°. "It seems safe to say that the thermal death point of yeast in bread making approximates 68° C."

Bacteriological examination of canned foods, A. W. and K. G. Bitting (*Nat. Canners Assoc. Bul. 14* (*1917*), *pp. 47, figs. 22*).—This article gives as the object of bacteriological examination of canned foods (1) "to determine whether foods which appear normal are sterile; (2) to determine whether foods which appear to be defective are sterile, and if not sterile, whether the spoilage be due to under-processing or to leaks; (3) to determine from the finished product the character of the original material—in legal verbiage whether the product is composed in whole or in part of filthy, putrid, or decomposed material." It gives an explanation of terms used, then takes up in detail the points in both general and microscopical examinations; gives tests for leaks and explains devices for recording pressure and heat penetration within the cans; discusses the results of lack of sterilization; and deals briefly with some of the organisms which cause spoilage.

The use of microorganisms to determine the preservative value of different brands of spices, Freda M. Bachmann (*Jour. Indus. and Engin. Chem., 10* (*1918*), *No. 2, pp. 121–123*).—The investigations on spices previously noted (E. S. R., 35, p. 557) were continued by a study of the effect of different brands of spices on the growth of molds, yeasts, and bacteria. Tabulated results of such a study using five brands of cloves, three of cinnamon, and three of allspice are given. Contrary to the earlier results, the investigations indicate that cloves may be as effective a preservative as cinnamon, "that there is considerable variation in the preservative value of the brands used, and that the growth of microorganisms on a spiced medium may be used as a criterion of the preservative value of the brand of the spice."

Camp cookery.—A cookery and equipment handbook for Boy Scouts and other campers, Ava B. Milam, A. Grace Johnson, and Ruth McNary Smith (*Portland, Oreg.: The J. K. Gill Co., 1918, pp. 7–108, figs. 5*).—This book contains lists of supplies and equipment for camping, suggestive rations, meal plans, food lists, and some camp recipes. It also gives a suggestive outline for the teaching of camp cooking.

Basic quantity food tables to be used in determining the daily issue of food to the kitchen (*New York, N. Y.: Dept. Pub. Charities, 1917, pp. 120*).—The tables given are designed to serve as a quick means of determining the quantity of food necessary for a given number of persons.

ANIMAL PRODUCTION.

Influence of the degree of fatness of cattle upon their utilization of feed, H. P. Armsby and J. A. Fries (*U. S. Dept. Agr., Jour. Agr. Research, 11* (*1917*), *No. 10, pp. 451–472, pl. 1, fig. 1*).—It is the usual experience in cattle feeding that as the animal fattens the increase in weight is made at a greater expenditure of feed. This experiment was made at the Pennsylvania Institute of Animal Nutrition to determine by comparison in a single individual the reasons that might be assigned for this fact. A steer in medium condition was fed a maintenance ration and afterwards a fattening ration made up of concentrates and alfalfa hay. At the conclusion of the trial the steer was fattened to an increase of 300 lbs. and again fed a fattening ration followed by a maintenance ration.

Both when the steer was in medium flesh and when fat the digestibility of the lighter ration was the greater. The results showed the corresponding rations to be equally digested with the unfattened and fattened animal. The relative losses of nitrogen, carbon, and energy in the urine were less on the heavy ration and a little greater in the fattened condition compared with the unfattened. The production of combustible gases was less on the heavier ration with the animal in both medium condition and fattened. The percentage of gross energy of the feed metabolizable was greater in the heavier ration, with the animal in either condition. The larger share of the additional heat in the heavier ration was eliminated by evaporation of water. The heat increment from a unit of feed was but little more in the fattened condition, while the net energy values and percentages of metabolizable energy available for gain were but slightly less.

After an increase in weight of 300 lbs. during three months' fattening the maintenance requirement of the steer was increased 36 per cent, which was greater than the comparative increase in weight or body surface.

"The lower economic efficiency of the fattened animal in this experiment was due chiefly to his higher maintenance requirement and only to a small extent, if at all, to a difference in the utilization of the surplus of feed over the maintenance requirement."

Experiments in crop utilization, C. R. Letteer (*U. S. Dept. Agr., Bur. Plant Indus., Work San Antonio Expt. Farm, 1916, pp. 19–22*).—Winter oats, field peas, Sudan grass, and Dwarf milo maize were used as pasture for eight pigs averaging 35 lbs. each. As the season was bad because of drought and early frost poor results generally were obtained and no conclusions were drawn.

Two yearling steers were pastured on 1.5 acres of winter oats from December 20, 1915, to March 6, 1916. The oats sown October 21 were divided into quarter-acre plats and were eaten very close at the time of the removal of the steers. The land was then seeded to Sudan grass, but the growth was so poor due to drought that it would support the steers only at intervals and no reliable data could be drawn.

Commercial feeding stuffs, J. L. Hills, C. H. Jones, and G. F. Anderson (*Vermont Sta. Bul. 204 (1917), pp. 6–39*).—The feeding stuffs examined included nearly 600 samples of about 350 brands of cottonseed meals and feeds, linseed meals, gluten feeds, dried distillers' and brewers' grains, wheat offals, hominy feeds, dried beet pulps, alfalfa meal, proprietary feeds, and miscellaneous feeds of provender, corn meal, oats, and rye.

Almost two-thirds of the cottonseed meals, two-fifths of the distillers' dried grains, one-tenth of the wheat feeds, and one out of six of the proprietary and poultry feeds were found deficient in protein. Suggestions are made regarding methods of avoiding buying inferior goods. The feeds examined are listed alphabetically and their guaranties and deficiencies pointed out.

The 28-hour law regulating the interstate transportation of live stock: Its purpose, requirements, and enforcement, H. Goding and A. J. Raub (*U. S. Dept. Agr. Bul. 589 (1918), pp. 19, pls. 5, figs. 6*).—The text of the present law, passed by Congress in 1906 (E. S. R., 19, p. 995), which supplanted the first act of 1873, is given and attention called to its purpose and requirements. Abuses under the law are noted and the favorable results from improved facilities for handling live stock set forth. While there have been many violations of the law and penalties applied, yet the influence has been good and conditions continuously bettered.

Increased cattle production on southwestern ranges, J. T. Jardine and L. C. Hurtt (*U. S. Dept. Agr. Bul. 588 (1917), pp. 31, pls. 12, figs. 2*).—This bulletin

gives certain preliminary results of work done by the Forest Service on the Jornada Range Reserve of about 200,000 acres in southern New Mexico to secure range improvement by natural revegetation, provision of stock-watering places, and determining the carrying capacity of the range as means of preventing overstocking.

The great risk in the live-stock industry of the ranges is that during certain years no rains come. In the past such seasons have wiped out the gains of years. The most uncertain period is from February to the beginning of the summer rains about July. It is advisable therefore to have forage in reserve during this period. In good years the proportion of the number of steers can be increased and in poor years they can be more rapidly sold without loss than the breeding stock. As an additional safeguard in times of scarcity the feeding of a concentrate, as cottonseed cake, should be provided for.

A pit silo of 20 tons capacity was filled with tobosa grass, *Hilaria mutica*, in August and opened late in the winter. The results of attempts to feed it indicate that it is not of economic value either as hay or silage. In another silo 150 tons of silage was made of soap weed, *Yucca elata*. From the preliminary feeding of 10 tons of this silage the indications are encouraging.

As the result of efforts, during three years, in reducing the number of stock during the growing season (July to October) to about half the number the area will carry for the year, and not overstocking during the remaining eight months, and making a better distribution of the watering places, the grama grass range was improved 50 per cent on the Jornada Reserve. For the best grazing of the range as well as the conservation of the forage the cattle should not have to travel more than 2.5 miles to water. This means a watering place for each 13,200 acres, an area that will carry about 500 head of cattle.

During 1916 the Jornada Range Reserve had an estimated carrying capacity of 41.45 acres per head. Where the grama grass makes up the bulk of the forage from 20 to 30 acres are required per head. On flats, slopes, and foothills it takes from 38 to 45 acres to support one head and on the mountain range 60 acres per head.

From 500 selected cows fed about 50 lbs. of cottonseed cake an 81 per cent calf crop was obtained compared to 69.2 per cent with the remaining cows of the reserve and an estimated return of 60 per cent from cows on adjoining unfenced range. Attention is called to the opportunity of increasing the calf crop by keeping poor cows in thrifty condition, by avoiding overstocking the ranges, and by using supplemental feeds when needed.

The average loss of stock on the reserve for 1915 was 1.9 per cent, and for 1916, 1.5 per cent. The average losses for New Mexico are for calves 10.6 per cent, yearlings 5.6, and older cattle 5.8. The small losses on the reserve are attributed to vaccination against blackleg, keeping grass in reserve for poor stock during the spring months, the feeding of a small quantity of cottonseed cake, and the prevention of straying.

The economical winter feeding of beef cows in the corn belt, J. S. COTTON and E. H. THOMPSON (*U. S. Dept. Agr. Bul. 615 (1917), pp. 16, fig. 1*).—An investigation carried out in the corn belt during three years shows that losses in producing beef calves for feeders, when they occur, are usually due to the high cost of maintaining the breeding cows. Attention is called to the importance of feeding farm by-products to this class of animals. Corn stover and straw may be utilized to a greater extent and special attention given to balancing rations.

In an inquiry covering 1,000 farms data on various phases of raising feeder cattle were secured. On 478 farms the average cost of a calf at weaning

time was $37. This varied in localities and especially in the methods followed by the breeders, ranging from $25 to over $50 per head.

The cows on the farms were divided into four lots in accordance with the number of feed units. The cost of winter feed varied with the amount of feed, averaging for the winter for the four lots, $10.70, $13.50, $18.50, and $21 per head, respectively. It is concluded that large quantities of feed in the last two lots were wasted. From the first lot 800 calves were sold at weaning time at an average profit of $4.60 per head while 700 from the last group sold at a loss of $8.90 per head.

In a study of the feeding methods on the 478 farms the cows on those where no cheap roughage was fed were wintered at an average cost of $18 each. Those using up to 40 per cent of cheap roughage wintered at a cost of $17.70, those with roughage up to 80 per cent $13.80, and those with roughage making up over 80 per cent of the ration at $9 per head.

While the feeding of grain is deemed frequently advisable, as in raising purebred and show cattle, yet it can often be dispensed with. On 154 of the farms studied corn was fed for at least a part of the time to the breeding herd. The average winter feed bill was $17.10 per head while in the remaining herds where no corn was fed the cost was $14.80 per head.

The investigations indicated that the feeding of unhusked corn fodder, a practice established years ago, is not profitable now with corn at present prices. Silage, though an excellent feed for breeding animals, was relatively more expensive than much of the cheap roughage.

A study of five representative farms is given with suggestions as to changes that seem in each case advisable.

Nature and rate of growth in lambs during the first year, E. G. Ritzman (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 11, pp. 607–624, figs. 2*).—Studies, by total weights and the measurements of parts, were made at the New Hampshire Experiment Station of the growth of lambs during their first year and the correlation of different sections of the animal body during this process. The measurements were made largely on skeletal dimensions and were not materially affected by flesh. Body size was measured by height, length of vertebral axis, depth, and spread of frame.

Experiments under way indicate that depth of body is the most satisfactory index of constitutional development. As the proportions of the parts of the bodies of newborn lambs are different from those of more mature animals, the measurements made at different periods and given in tables and diagrams show the proportionate changes taking place.

The most rapid development in the growth of young lambs occurred in the period following birth, decreasing as they reached maturity. In this study the lambs in their first three months made at least 50 per cent of their growth for the first year in dimensions and over 60 per cent of their weight. In their second three months they made 20 per cent, the lessening being partly due to the lambs going on pasture and being weaned. During the third quarter, coming in the fall of the year, the lambs made 20 per cent more growth, and during the fourth or winter period not over 5 per cent. This indicates, from an economic standpoint, that under usual conditions the greatest profits are to be expected when the surplus as lambs is marketed as early in life as they can be fitted for sale.

Fish meal as a feed for swine, F. G. Ashbrook (*U. S. Dept. Agr. Bul. 610 (1917), pp. 9*).—Although fish meal has been used as a feed in foreign countries for some years its use in the United States for this purpose has been almost negligible. While valuable as a fertilizer it is deemed more profitable to first employ it as a feed.

In an experiment made at the Bureau of Animal Industry Experimental Farm at Beltsville, Md., two lots of 12 pigs after weaning were fed 112 days on a basal ration composed of corn meal and middlings, four parts each. In addition one lot was fed one part of tankage and the other one part of fish meal. The lot on tankage made an average daily gain of 1.25 lbs. per head with 3.62 lbs. of feed per pound of gain. The lot on fish meal averaged 1.31 lbs. daily with 3.65 lbs. of feed per pound of gain.

During a second period the same 12 pigs were fed 28 days as follows: Lot 1 corn meal, middlings, and fish meal, 4 : 4 : 1; lot 2 corn meal and fish meal, 9 : 1; and lot 3 corn meal and tankage, 9 : 1. Lot 1 made an average daily gain of 1.91 lbs. per head with 4.21 lbs. of feed per pound of gain; lot 2 gained 2.16 lbs. daily with 3.93 lbs. of feed per pound of gain; and lot 3, 2 lbs. daily with 4.62 lbs. of feed per pound of gain.

In another experiment four lots of three pigs each, averaging about 150 lbs., were fed 56 days. Lot 1 on corn meal and tankage, 6 : 1, made an average daily gain of 1.57 lbs. per head with 4.03 lbs. of feed per pound of gain; lot 2 on dried pressed potato and tankage, 6 : 1, a daily gain of 0.8 lb. with 6.95 lbs. of feed per pound of gain; lot 3 on dried pressed potato and oil meal, 6 : 1, a daily gain of 0.91 lbs. with 5.84 lbs. of feed per pound of gain; and lot 4 on dried pressed potato and fish meal, 6 : 1, 1.32 lbs. with 4.28 lbs. of feed per pound of gain.

The heaviest hog from each lot in these experiments was tested, both meat and lard, to determine whether the fishy odor or taste was apparent. In no case was there any indication that feeding fish meal transmitted any undesirable taint to the pork.

The pigs in the experiments outlined ate the fish meal without trouble and with relish, and were never off-fed during the tests. It proved to be a very effective supplement to a grain ration, and was superior to tankage in that respect in all the comparisons reported.

Feeding dried pressed potatoes to swine, F. G. Ashbrook and R. E. Gongwer (*U. S. Dept. Agr. Bul. 596* (*1917*), *pp. 10, pls. 2, figs. 2*).—The U. S. Department of Agriculture has been making a study of the preservation of potatoes by drying. An experiment was made at its farm at Beltsville, Md., to determine the value of this product for fattening pigs and the effects of the ration on the quality of the meat.

Four lots of three pigs each, averaging about 150 lbs., were fed for 56 days on the following rations: Lot 1 corn meal and tankage, 6 : 1, lot 2 dried pressed potato and tankage, 6 : 1, lot 3 dried pressed potato and linseed oil meal, 6 : 1, and lot 4 dried pressed potato and fish meal, 6 : 1. They made an average daily gain with pounds of feed per pound of gain as follows: Lot 1, 1.57 lbs. with 4.03 lbs. of feed; lot 2, 0.8 lb. with 6.95 lbs. of feed; lot 3, 0.91 lb. with 5.84 lbs. of feed; and lot 4, 1.32 lbs. with 4.28 lbs. of feed.

Mixing or soaking the dried pressed potato for from 15 to 20 minutes was the best method of feeding it. The analyses indicate that it should be combined with a high protein feed and the results of this experiment indicate that it is efficient when so fed in producing good gains with pigs.

No difference could be noticed in the curing or the quality of the finished product of the pigs in the four lots.

Proportions of supplements to corn for fattening swine, W. L. Robison (*Ohio Sta. Bul. 316* (*1917*), *pp. 57, figs. 23*).—Though it has been well demonstrated that corn must have supplemental feeds combined with it for the best results in fattening swine, the best proportions of the mixture have not been

thoroughly worked out. These experiments were carried on to determine the optimum amounts of tankage, soy bean meal, linseed meal, and skim milk with corn in pork production.

In the first experiment three lots of five pigs each were fed for 16 weeks just after weaning on coarsely ground corn and tankage. In lot 1 the tankage was fed in a definite proportion with the corn, in lot 2 in a constant daily amount, and in lot 3 in a decreasing percentage, beginning with 20 per cent the first week and decreasing 1 per cent weekly to 5 per cent at the close. The results, while not differing greatly, were in favor of the first and third lots.

In a second trial with three lots of four pigs each, averaging 57.5 lbs., lasting 16 weeks, the pigs fed tankage in decreasing amounts each week made larger gains and required less feed per unit of gain than those fed the tankage in a definite proportion with the corn or those on a constant daily allowance.

In a third trial two lots of four pigs each, averaging 75 lbs., were fed for 16 weeks. Lot 1 was fed corn and tankage, 8:1, and lot 2 corn with tankage decreasing from 20 to 5 per cent. The results were the reverse of those in the two preceding trials, the feeding of definite amounts of tankage giving greater increases in weight at a lower expenditure of feed.

In a fourth experiment 30 pigs averaging 47 lbs. were divided into six lots and fed narrow, medium, and wide rations of tankage with corn, the supplement being fed in constant proportions and in decreasing amounts. With large amounts of tankage the best results were obtained in feeding it in a definite proportion to corn. With small amounts of tankage best results were shown when it was fed in larger amounts at first, gradually decreasing the proportions. The medium rations gave better returns than the wide or narrow.

The fifth experiment was made to compare tankage, soy beans, and linseed meal as supplements to corn (the first two in varying amounts) in feeding hogs. Eight lots of five pigs each, averaging 144.9 lbs., were employed. Those fed 10 per cent of tankage in the ration made a 36.2 per cent average increase in rate of gain and required 10.4 per cent less feed than the lot on corn alone. Better returns were given with 10 per cent of tankage in the ration than with 20 per cent or with 5 per cent. As the supplemental feed increased in the ration more of it was required to replace a unit of corn. On a basis of equal amounts of protein soy bean meal and linseed meal gave a higher result than tankage, owing to their nonnitrogenous contents. Tankage was most consistent in producing economical gains. In the beginning of the experiment soy bean meal gave gains with less feed, but in the latter part of the experiment it was surpassed by linseed meal.

In the sixth experiment a lot of six pigs averaging 71.75 lbs. was fed corn and tankage in a self-feeder for 14 weeks, being allowed to select either feed as wanted. They made an average daily gain of 1.5 lbs. per head with the use of 3.89 lbs. of feed per pound of gain. The amount of tankage consumed increased during the first three weeks from 14.6 to 19 per cent of the ration and then decreased to about 5.6 per cent for the last eight weeks of the test. The average consumed during the experiment was 12.4 parts of corn to 1 part of tankage.

In the seventh experiment three trials were made of skim milk as a supplementary feed with corn for pigs in dry lot. Where fed ad libitum the pigs consumed less milk as they became older. As the milk was increased in the ration its replacement value with corn was decreased. Compared with tankage as a supplement to corn it was less costly per pound of gain, though there was less difference during the second half of the test than there was during the first half.

In the eighth experiment pigs averaging 79 lbs. were used in five lots of five each in comparing corn and skim milk alone and in combination, and corn and tankage. The experiment lasted 15 weeks. Rations of corn alone and skim milk alone gave poor results compared with a combination of the two feeds. The pigs fed skim milk alone made fair gains but did not fatten. They consumed daily an average of 36.7 lbs. of skim milk each and gained over 1 lb. per day. With a ration of skim milk and corn in equal parts compared with corn alone, 3.37 lbs. of the former replaced 1.37 lbs. of the latter. With skim milk as the supplement to corn, less nutrients were needed per pound of gain than when tankage was the supplement. With tankage, however, the rate of gain was higher.

The ninth experiment was made to secure further data on the use of varying proportions of corn and skim milk for fattening pigs. Seven lots of five pigs each were employed, of which five lots were fed corn and skim milk in different proportions, one corn alone, and one corn and tankage. The initial weight of the pigs averaged 43.6 lbs. and the experiment lasted 15 weeks. The lot fed corn alone made a very poor showing, averaging 0.35 lb. daily gain per head at a cost of 6.85 lbs. of feed per pound of gain. The lot on corn and tankage, 9:1, made a lower rate of gain than any of the lots on a corn and skim milk ration. With corn and skim milk in equal parts, and corn and tankage, 9:1, less dry matter of the skim milk than of the tankage was required per pound of gain. As the proportion of skim milk to corn increased above 50 per cent in the ration there was a decrease in its replacement value. Where the pigs were fed corn and skim milk ad libitum, the ratio of milk to corn increased for the first five weeks and gradually decreased from the seventh to the fifteenth week. The pigs consumed an average of 20.5 lbs. of milk daily or an average of 6.4 lbs. of milk to 1 lb. of corn. Their rate of gain was higher than that of those receiving less milk, while the amount of total nutrients required per pound of gain was lower.

Some conclusions from the results of all the experiments noted are indicated. While further experiments are necessary to determine the best proportion of tankage to feed to pigs, it appears that where as much as 10 per cent is given there is no advantage in feeding a larger proportion in the earlier than in the later period of the test, but where the tankage is 5 per cent of the ration it is advisable to feed a larger proportion in the beginning.

The results indicate that as a supplement to corn skim milk has an advantage over tankage, especially for young pigs. There is believed to be no one best supplementary feed to corn nor one best ratio in which to feed it. There must be taken into consideration the age of the pigs, the market price when finished, and the prevailing prices of corn and available supplements.

The self-feeder for hogs, F. G. Ashbrook and R. E. Gongwer (*U. S. Dept. Agr., Farmers' Bul. 906* (*1917*), *pp. 12, figs. 9*).—In an experiment made at the Department Experiment Farm at Beltsville, Md., two lots of nine pigs each were fed by hand and self-feeder for 70 days on corn meal, middlings, and tankage. The hand-fed lot made an average daily gain of 1.04 lbs. per head at the rate of 4.1 lbs. of feed per pound of gain. The lot self-fed made a corresponding gain of 1.62 lbs. with a food consumption of 4.06 lbs. of feed.

In another experiment lasting 28 days, five pigs on rye pasture, corn meal, and tankage, self-fed, made an average daily gain of 1.61 lbs. per head using 3.63 lbs. of feed per pound of gain. The corresponding gains for five pigs on rye pasture, shelled corn, and tankage, self-fed, were 1.53 lbs. with a consumption of 3.32 lbs. feed, and for a third lot of five on rape pasture, corn meal, middlings, and tankage, 5:4:1, hand-fed, 1.48 lbs. with a consumption of 3.69 lbs. of feed.

From a compilation of results at numerous experiment stations with nearly 600 pigs those hand-fed consumed an average of 5.47 lbs. of feed per head daily and made an average daily gain of 1.23 lbs., while those self-fed ate 8 lbs. of feed daily and made an average daily gain of 1.92 lbs.

Several types of self-feeders are figured and described.

Killing hogs and curing pork, F. G. Ashbrook and G. A. Anthony (*U. S. Dept. Agr., Farmers' Bul. 913 (1917), pp. 39, figs. 22*).—This publication treats of home equipment for handling pork, and the killing, dressing, cutting, and curing, including lard rendering, brine and dry curing, smoking, and sausage making. A farm smokehouse is described, and a small ice house is figured and specifications for its construction given.

Standardized war rations for poultry, H. R. Lewis (*New Jersey Stas. Hints to Poultrymen, 6 (1917), No. 3, pp. 4*).—The text is given of resolutions adopted at a conference held in New York City November 22, 1917, by representatives of the poultry departments of the colleges of agriculture of New York, Connecticut, Massachusetts, and New Jersey. These resolutions urged the fixing of prices for corn and the compulsory sale of cold-storage poultry products.

The following standardized war rations for poultry were also approved: (1) Scratch rations—cracked corn, feed wheat, heavy oats, and barley, 5:1:2:2; (2) mash—equal parts of wheat bran; wheat middlings; corn meal, corn meal feed, or hominy; gluten feed; crushed or ground bone; and meat scrap.

Capons and caponizing, R. R. Slocum (*U. S. Dept. Agr., Farmers' Bul. 849 (1917), pp. 15, figs. 10*).—A revision of Farmers' Bulletin 452 (E. S. R., 25, p. 375).

DAIRY FARMING—DAIRYING.

The relation of the milk-vein system of dairy animals to production, A. W. Aldrich and J. W. Dana (*Vermont Sta. Bul. 202 (1917), pp. 3–24, figs. 3*).—Measurements were taken of the milk-vein systems of more than 600 cows in the university herd and in the cow-testing associations of the State. These were compared with the yearly milk and fat yields for as many years as there were records.

Measurements on a few cows were taken several times during the year to find out how much variation there is in the same vein at different stages of the lactation period. A slight increase was found in the size and crookedness of the veins of some young cows after freshening but not enough to affect the outcome appreciably. The age of the cow was not taken into consideration in making up the tables.

Correlation data on the different points compared are tabulated, and the calculations in connection with one of the comparisons are given. It was found that some degree of correlation seems to be traceable as between (1) the size of the milk wells and the milk and fat yields, (2) the diameter of the milk veins and the milk yield, and (3) body length and milk vein length. There also seems to be some probability that cows showing forks or extensions of the milk vein system may be better milk and butter producers than those not thus favored.

The influence of the sire on the herd, J. H. Wilson (*Vermont Sta. Bul. 202 (1917), pp. 39–44*).—During the 20 years in which the station herd consisted essentially of grade Jerseys four pure-bred Jersey bulls were used. Data are tabulated showing the production of the daughters of these bulls and of their dams. Each bull at the time of purchase was thought to be a superior animal, and from the standpoint of pedigree should have done good service. The four methods used for comparing the production of the daughters with that of their

dams are outlined, and the disadvantages of drawing conclusions from such comparisons are pointed out. Bearing in mind the limitations referred to, the author rates two of the bulls as rather unsuccessful, one as a serious detriment, and one as fairly successful.

Feeding trials with dairy cows in Denmark, A. V. Lund (*Ber. K. Vet. og Landbohöjskoles Lab. Landökonom. Forsög* [*Copenhagen*], *89* (*1915*), *pp. 109; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr.*, *7* (*1916*), *No. 10, pp. 1478–1481*).—The results of the following experiments are noted:

I. *Trials with mangels and turnips.*—In the first test one lot of cows was fed 79.8 lbs. of mangels (9.3 lbs. of dry matter) per head daily, and another lot 84 lbs. of turnips (9.26 lbs. of dry matter). During the test the average increase of milk yield was 0.73 lb. per cow daily, or about 2.5 per cent, for the cows fed mangels as compared with those fed turnips. No difference was noted in the composition of the milk or in the general condition of the two groups of cows.

In a comparison of mangels and turnips of low dry matter content with those of comparatively high dry matter content the results showed that the difference in feeding affected neither the quality of milk, its composition, nor the general condition of the cows.

In testing the effect of roots on the quality of butter 16 cows were fed 99.2 lbs. of turnips each daily, and another lot of 16 cows, 88.2 lbs of mangels. The butter churned from milk from the turnip-fed lot had a higher iodin number and olein content than that from the mangle-fed lot.

II. *Trials with cacao cake.*—Experiments lasting more than two years were made with two lots of cows, one lot being fed steadily on cacao cake. During the first year 1.75 lbs. per head of peanut and soy bean cake, fed daily to the first lot, was replaced by 2.42 lbs. of cacao cake. The quantity of milk diminished but the fat content did not increase so as to equal that of the permanently cacao-fed lot. In the second year an attempt was made to ascertain the influence of the addition of 1.54 lbs. of cacao cake, particularly as to whether the milk yield was maintained and at the same time the percentage of butter increased. The cacao-fed lot, however, in spite of the addition of cake to its ration, gave less milk than did the other lot, although this contained 0.15 per cent more milk fat, so that the cows of the two lots produced almost the same amount of milk fat. As in the preceding trial, the milk from the cacao-fed lot proved to be richer in protein but poorer in sugar and ash. A similar trial made in the third year gave concordant results.

III. *Poisoning by theobromin due to cacao cake.*—In the experiments here reported by G. H. Hansen, it is noted that cacao cake contains an amount of theobromin approximately equal chemically and pharmacologically to the caffein content in coffee and tea. Laboratory experiments both with cacao cake and with theobromin on fowls, rabbits, and mice led to the conclusion that, owing to its poisonous character, cacao cake should not be used as a cattle feed.

Experiments on the use of rice polish in the feeding of milch cows, R. Giuliani (*Clin. Vet.* [*Milan*], *Rass. Pol. Sanit. e Ig.*, *40* (*1917*), *Nos. 13, pp. 384–392; 14–15, pp. 403–427*).—The author describes the milling of rice and its by-products and the physico-chemical properties and keeping qualities of rice polish, including results of analyses. Results are given of experiments with eight cows in feeding rice polish.

It is noted that rice polish is not injurious to the health of cows, but the use of ordinary rice polish which contains some of the finer portions of crushed rice hulls may cause coughing. The amount of rice polish safe to feed

depends, therefore, upon its purity. The feeding of rice polish has practically no influence on the quantity or quality of milk. For maintenance of weight rice polish compares favorably with wheat bran. The cheapness of rice polish makes it of economic importance in the feeding of dairy cows.

The cost of milk and fat production in Vermont in 1911 and 1912, G. M. Nelson (*Vermont Sta. Bul. 202* (*1917*), *pp. 25–39, figs. 6*).—Results are given of a survey in 1911 and 1912 of 71 herds containing 1,547 cows and owned by members of cow-testing associations in seven counties of the State.

The costs other than feed of keeping a cow for a year varied from $53.39 to $19.18 and averaged $36.87. The feed costs varied from $65.34 to $21.35 and averaged $42.18 per cow. Of 58 herds, totaling 1,170 cows, the owners of which were personally visited by the author, the herd average milk production per cow varied from 6,822 to 3,512 lbs. per annum, with a general average of 5,157 lbs. The corresponding milk fat production averages were 349, 142, and 242 lbs. Valuing milk at $1.80 and skim milk and buttermilk at 30 cts. per hundredweight and milk fat at 32 cts. per pound, with an additional credit per cow of $1 for a calf and $8 for manure, the net income per cow varied from $13.45 for milk and $5.83 for fat in the low-producing herds to $33.61 for milk and $32.39 for fat in the highest-producing herds. The total cost of production varied from $1.51 to $1.31 per hundredweight for milk and from 34.5 to 28.5 cts. per pound for fat. In general, the trend was toward more economical production as the herd increased in size.

The data obtained in the study are set forth in graphs and circles.

The cost of producing market milk in 1916–17 on 212 Vermont farms, G. F. E. Story and W. J. Tubbs (*Vermont Sta. Bul. 209* (*1917*), *pp. 3–24*).—A study is reported of the cost of producing milk during the 12 months ended April 30, 1917, in 212 herds containing 4,650 cows in 12 counties of Vermont, together with comments on the feeding and management of dairy herds under present conditions.

The average total expense per cow on these farms was $136.11, of which $66.60 was for feed and $35.62 was for labor. Deducting $7.28 for increased value per cow due to abnormal war conditions, $12.96 for manure, $3.52 for calf, and 49 cts. for hides and feed bags, there remained a net cost of $111.86 to be defrayed by the returns from the sale of milk. The average milk production of these herds was 2,478 qts. (5,328 lbs.) per cow. For this amount of milk the cost at the farm was 4.51 cts. per quart, or with a charge of 0.273 ct. per quart for hauling, the cost at the railroad station was 4.78 cts. per quart. The effect of the amount of milk produced per cow upon the cost of production is indicated by data which show that the cost varied from 5.78 cts. per quart on farms averaging 3,535 lbs. per cow to 3.77 cts. per quart on farms averaging 7,701 lbs. per cow.

An outline for computing cost of milk production and blank forms used in securing the data in this study are given.

Concerning the Burlington milk supply, J. E. Carrigan and W. T. Abell (*Vermont Sta. Bul. 202* (*1917*), *pp. 44–47*).—A study of the conditions under which the milk supply of Burlington is handled and of the possibility of securing a better and more uniform supply at less cost by establishing a central processing plant and decreasing the duplication of delivery routes.

Studies on the hygienic production of milk.—Importance and control of the microflora of the udder in the selection of dairy cows, C. Gorini (*R. Ist. Lombardo Sci. e Let. Rend., 2. ser., 49* (*1916*), *No. 14, pp. 480–489; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 7* (*1916*), *No. 10, pp. 1482, 1483*).—The author reviews his previous experiments on the micro-

flora of the udder of cows, and gives results of investigations at the Agricultural High School of Milan from which it is concluded that the importance of the microflora of the udder increases as milking approaches the ideal condition of absence of external microbial contamination. The microorganisms of the udder are most often found grouped in albuminous clots, which not only makes their enumeration difficult, but also gives them a marked power to resist heat, although they are not sporulating. The microflora of the udder are not affected by the hygienic condition of the cow sheds, and for this reason bacterial counts of milk may not give a true indication of the cleanliness of the milking process. The microflora of the udder seem to be connected with external and internal factors which still require to be investigated. With certain cows the quantitative and qualitative examination yield such persistently high results that the condition may almost be described as abnormal though not pathological.

For the production of sanitary milk, especially for the feeding of infants and invalids, the author proposes that in the selection of cows not only their state of health but also the microflora of their udders should be taken into account. In the examination of udder microflora the ordinary methods of culture on artificial media can not be used. It is suggested that aseptically drawn milk be examined by the fermentation test, which should be carefully standardized.

What is meant by "quality" in milk, H. A. Harding, R. S. Breed, W. A. Stocking, jr., and E. G. Hastings (*Illinois Sta. Circ. 205 (1917), pp. 3–16*).—This analysis of the problem by the committee on milk quality of the American Dairy Science Association contains a brief summary of previous work on various phases of the question, a plea for a broader consideration of the problem of milk quality, and suggestions regarding future progress in improving city milk supplies. The elements of quality in city milk are summarized under the headings of food value, healthfulness, cleanliness, and keeping quality. An outline for grading milk is proposed.

Enzyms of milk and butter, R. W. Thatcher and A. C. Dahlberg (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 9, pp. 437–450*).—At the Minnesota Experiment Station several lots of butter were prepared under carefully controlled conditions of manufacture, and held in cold storage in order to study the effect of varying methods of manufacture and storage upon the keeping qualities of the butter. A study of the enzym content of the butter after storage is here reported.

Deterioration in quality of butter during storage has been considered by some investigators to be due to the action of enzyms contained in it. Fat-splitting (lipase) or protein-hydrolyzing ("galactase" or casease) enzyms have been suggested as possible agents in causing deterioration. The authors state that lipases are present in butter in very small amounts, if at all, and that they could not be conceived to be sufficiently active at the low temperature used in butter storage to cause any appreciable change in the quality of the butter. The protein-hydrolyzing enzym was found to be completely inhibited by sodium chlorid in the concentrations which are present in the water contained in all normally salted butters. This fact, together with the known inhibiting effect of low temperatures upon proteolysis by enzyms, makes it impossible that the hydrolysis of proteins in the butter by enzyms plays any part in deterioration changes.

"Proteolysis in skim milk was completely inhibited by 1 per cent of chloroform and by 15 per cent of sodium chlorid. Galactase can not act in normal butter because of the high salt content. In the separation of milk the factors

which increase the percentage of casein in the total nitrogen also increased the galactase content. The ripening of cream did not increase the rate of proteolysis. No oxidase was found in milk or butter. Only one sample of butter gave any evidence of lipase at the end of four days at 40° C. The enzym content of butter is very small, because of the high dilution in fat. Expressed on the basis of total nitrogen the butter examined contained as much galactase as fresh whole milk, twice as much catalase, but only one one-hundred-sixtieth as much peroxidase. The cold storage of butter weakens the peroxidases, but has little effect on the catalase and galactase."

It is concluded that enzyms are not to be considered as a factor in the deterioration of butter during cold storage.

A list of the literature cited as included.

Suggestions for a standard for butter, H. Veeder, R. C. McManus, W. P. Jones, and G. P. McCabe (*Chicago: Swift & Co., 1917, pp. 75*).—As a result of a study of the provisions of existing laws, decisions of the courts, and other data, the following standard for butter is suggested:

"That the only ingredients which may be used in the manufacture of standard butter are those named in the law of August 2, 1886. These ingredients are milk or cream or both, with or without common salt, and with or without additional coloring matter. That milk or cream used in the manufacture of standard butter shall be (1) pasteurized, or (2) from properly tuberculin-tested, nonreacting herds. That milk and cream used in the manufacture of standard butter shall not be filthy, putrid, or decomposed within the meaning of the Food and Drugs Act, and that standard butter shall not be made to contain abnormal quantities of salt or curd, and shall contain a definite minimum percentage of butter fat. For the information of butter makers, there should be a suggestion as to what are the variable limits in standard butter of the normal quantities of such substances. That no standard butter shall be made from butter or butter fat in which any substance whatever has been used to deodorize or remove rancidity. That in the manufacture of standard butter no process or material shall be used which has the effect of causing the butter to absorb abnormal quantities of water, milk, or cream. For the information of butter makers there should be a suggestion as to what are the variable limits in standard butter of normal quantities of moisture. That, if it shall be found that small quantities of lime, or of sodium carbonate, or other alkaline salts may be used as ingredients in butter making without violation of the Food and Drugs Act, such butter shall not be standard butter, but shall be defined as 'neutralized butter' or 'limed butter' and shall only come within the terms of such definition when the butter or butter fat from which the product is made has not been deodorized, or had rancidity removed or masked; otherwise it is adulterated butter."

Making butter on the farm, W. White (*U. S. Dept. Agr., Farmers' Bul. 876 (1917), pp. 23, figs. 18*).—Detailed directions for making butter under farm conditions are given, together with notes on the causes of difficult churning and the equipment needed for butter making on the farm. A plan for a dairy house is included.

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Pathogenic microorganisms, W. H. Park and Anna W. Williams (*New York: Lea & Febiger, 1917, 6. ed., enl. and rev., pp. X+17–709, pls. 9, figs. 209*).—In the enlargement and revision of this work (E. S. R., 21, p. 579) the authors were assisted by C. Krumwiede, jr., and others.

Common parasites of farm animals, W. M. BURSON (*Bul. Ga. State Col. Agr., No. 137 (1917), pp. 39, figs. 19*).—A popular account of the more important ectoparasites and endoparasites of farm stock.

Observations on the stability of the erythrocytes of the ox, pig, and sheep, M. W. LYON, JR. (*Jour. Infect. Diseases, 22 (1918), No. 1, pp. 49–52*).—"The ease with which the erythrocytes of the ox, pig, and sheep are broken up by the same agent bears no relation to the zoological position of the three animals. The erythrocytes of the ox on the whole are comparatively stable in most circumstances and appear to be well adapted as an indicator in complement-fixation tests with human serum, much better than are sheep corpuscles. Sheep erythrocytes are comparatively unstable, though relatively resistant to eel serum. Their use in complement-fixation tests with human serum introduces a variable factor which is undesirable, although it has probably little effect on the final value of the tests. Erythrocytes obtained at random from abattoir animals on the whole behave similarly from week to week, and appear to be quite as suited for hemolysis experiments and indicators in complement-fixation tests as are the corpuscles from a single animal. Ox erythrocytes seem to have better keeping qualities than the erythrocytes of the pig or sheep."

The clinical pathology of the blood of domesticated animals, S. H. BURNETT (*New York: The Macmillan Co., 1917, 2. ed., rev. and enl., pp. XVI+166, pls. 4, figs. 23*).—A second revised and enlarged edition of this work (E. S. R., 21, p. 78), which is intended as a textbook of hematology (1) for students and practitioners of veterinary medicine, and (2) for investigators, to whom it renders easily accessible data concerning the blood of the kinds of experimental animals commonly used. In this edition what is considered to be the normal for each species is stated. Tables summarizing the results obtained by the different investigations are also given. Each of the 11 chapters is accompanied by a copious bibliography.

Histology of Astragalus mollissimus, NEVA RITTER (*Kans. Univ. Sci. Bul., 10 (1917), No. 8, pp. 197–208, pls. 4*).—A report of studies of a loco weed.

The effect of exposure to temperatures at or above 100° C. upon the substance (vitamin), whose deficiency in a diet causes polyneuritis in birds and beriberi in man, HARRIETTE CHICK and E. MARGARET HUME (*Proc. Roy. Soc. [London], Ser. B, 90 (1917), No. B 624, pp. 60–68*).—"Exposure of wheat embryo to a temperature of about 100° C. for two hours resulted in no significant loss in antineuritic 'vitamin.' If, therefore, it is included in the flour from which bread or biscuit is made, it can be relied upon to retain its antineuritic properties after baking. At temperatures in the neighborhood of 120°, however, there was a swift destruction of antineuritic properties. This fact has an important bearing where diets are largely composed of preserved and tinned foods previously sterilized at temperatures above 100°." In experiments with yeast extract the destruction of the vitamin was rapid at 120°.

The effect of X-rays upon diseases of bacterial origin, C. KEMPSTER (*Sci. Amer. Sup., 84 (1917), No. 2181, pp. 243, 244*).—It is concluded that the effect of X-rays upon diseases of bacterial origin is due to the decided inhibitory influence upon the reproduction and increase in the germs, and to the stimulation of the living tissues resulting in an increased phagocytosis, and not to any germicidal power.

A new mercurial germicide (*Jour. Lab. and Clin. Med., 2 (1917), No. 9, pp. 669, 670*).—Results obtained by Schamberg, Raiziss, and Kolmer, of Philadelphia, in the preparation of a new mercurial germicide are summarized from the report to the National Research Council. It is prepared by the introduction of mercury into the phenol group, and the trade name proposed is Mercurophen. The results of a thorough examination indicate that the new compound is a

much stronger antiseptic and disinfectant than mercuric chlorid, while the precipitating effect on human serum is much less.

Annual report of the civil veterinary department, Bihar and Orissa, for the year 1916-17, D. QUINLAN (*Ann. Rpt. Civ. Vet. Dept. Bihar and Orissa, 1916-17, pp. 4+8+XVI+2*).—The usual annual report (E. S. R., 36, p. 879).

Annual report on the Punjab Veterinary College, civil veterinary department, Punjab, and Government Cattle Farm, Hissar, for the year 1916-17, C. A. H. TOWNSEND, H. T. PEASE, and J. FARMER (*Ann. Rpt. Punjab Vet. Col. and Civ. Vet. Dept., 1916-17, pp. II+2+15+XVIII*).—The usual annual report (E. S. R., 37, p. 78).

Infection and immunity, V. C. VAUGHAN (*Chicago: Amer. Med. Assoc., 1915, pp. 238*).—This monograph is a part of the Commemoration Volume, issued by the American Medical Association as a tribute to the medical sciences "which made possible the building of the Panama canal." The purpose of the author is to "state the essential facts of infection and immunity accurately and simply, so that they may be understood by the intelligent, nonprofessional man."

The section on infection includes a historical review of the development of the germ theory, chapters on the general characteristics of bacteria and avenues of infection, and separate chapters on 19 diseases of infectious origin, describing briefly the history, organism, and the sources and avenues of infection. The section on immunity includes chapters on phagocytosis, precipitins, agglutination, opsonins, and germicidal sera. The volume closes with a discussion of the general principles and mechanism of infection and immunity.

The intracutaneous absorption of antigen, G. H. SMITH and M. W. COOK (*Jour. Immunol., 2 (1917), No. 3, pp. 269-281, fig. 1*).—By anaphylactic and precipitin reactions with sensitized, normal, and immunized guinea pigs subjected to intracutaneous injections of antigen, the authors conclude that the absorption of antigen from the cutaneous tissues of specifically immunized animals is much more rapid than in normal animals. The absorption in sensitized is less than in immunized but greater than in normal animals.

The specificity of intracutaneous absorption, G. H. SMITH and M. W. COOK (*Jour. Immunol., 3 (1918), No. 1, pp. 35-42*).—In this article the subject of intracutaneous absorption of antigen, noted above, is discussed from the standpoint of specificity. Guinea pigs immunized to one antigen were tested by the intracutaneous injection of the specific and of a heterologous antigen to determine the relative rate of absorption of antigen. Precipitin and agglutination reactions were employed. The possibility that normal animals possess a selective action for a certain antigen was disproved by a series of tests with various antigens, no difference in elimination of antigen being noted.

From the results of their experiments the authors conclude that "from the point of view of absorption of antigen, the immune state with the changes dependent upon it is the result of a heightened reactivity for the specific antigen only, and does not stimulate the mechanism of elimination of heterologous antigens." The nonspecific antigen is, moreover, not removed so rapidly from an immunized animal as is the same antigen from a normal animal.

Preparation of protein extracts for diagnostic cutaneous tests, N. S. FERRY (*Jour. Lab. and Clin. Med., 2 (1917), No. 9, pp. 655-657*).—The following method has been successfully used by the author:

The protein is first extracted with sterile water containing just enough of an oil of high efficiency to act as a preservative. Glycerin is added and the solution evaporated to a standard strength. Sufficient boric acid is added to the extract to make a heavy paste. This is put up in small collapsible tubes and applied with a sterile toothpick. By this method the proteins are thor-

oughly extracted, accurately standardized, and well preserved. The paste is nonirritant and perfectly soluble in the body fluids.

[A rapid method for the production of precipitin antigen from bacteria], C. KRUMWIEDE, JR., and W. C. NOBLE (*Jour. Immunol.*, *3* (*1918*), *No. 1*, *pp. 1–10*).—A very rapid method of preparing a concentrated precipitin antigen from bacteria is described. A heavy suspension of bacteria in water is dissolved by boiling in sufficient alkaline hypochlorite solution to give a final concentration of 5 per cent. This is neutralized with normal hydrochloric acid and precipitated with 95 per cent alcohol. The precipitate is boiled with normal saline solution and centrifuged, the supernatant liquid being the finished antigen.

This method differs from others in use in that the hypochlorite solutions are boiled instead of being used in the cold, thereby hastening the process. It is the opinion of the authors that the method is applicable to all bacteria with the exception of the acid-fast types, and should be of value in experimental work where a readily obtainable supply of concentrated antigen is needed.

Contributions to the biochemistry of pathogenic anaerobes.—I, The biochemistry of Bacillus welchii and B. sporogenes, C. G. L. WOLF and J. E. G. HARRIS (*Jour. Path. and Bact.*, *21* (*1917*), *No. 3*, *pp. 386–452*, *figs. 19*).—This forms part of an investigation of the pathogenic anaerobes in their relation to wound infection.

"Both the organisms investigated have certain properties in common, which they exercise to different degrees. They grow with varying vigor on media with or without the presence of carbohydrates and under favorable conditions produce large quantities of gas. For their growth they are dependent on a certain initial concentration of amino acids. Before gas is evolved their activities seem to be chiefly directed toward a proteolysis in preparation for further development and gas formation.

"*B. sporogenes* is particularly potent in its proteolytic action, and during active growth will further digest a peptone solution which has been made by the exhaustive treatment of a protein with trypsin and erepsin. It will break down an albumin-like alkaline egg, until 28 per cent of the total nitrogen originally present is in a form reacting with nitrous acid. Both organisms have butyric acid as an end product. The source of this acid in *B. perfringens* fermentations is unquestionably the sugar group, if sugar be present. *B. sporogenes* forms large quantities of butyric acid in sugar-free media. In those media containing lactose, this sugar is not apparently greatly affected."

Successful treatment of anthrax by various methods, D. G. DUDLEY (*Jour. Amer. Med. Assoc.*, *70* (*1918*), *No. 1*, *pp. 15–17*).—The author has used with success the following method of treatment of anthrax in human beings infected in the handling of hides improperly disinfected. The first treatment, where possible, is excision of the lesion. Eight per cent phenol is injected into the tissues around the lesion, and $\frac{1}{4}$ in. beyond the phenolized zone five or six syringefuls of 25 per cent alcohol are injected. After the excision, the base and edges of the wound are painted with 95 per cent phenol neutralized with absolute alcohol and wet dressings applied. If the excision fails, continued injection of 8 per cent phenol into the tissues is followed. Antianthrax serum should then be used. The first dose is 35 cc. injected intravenously, followed in from 8 to 16 hours by a second dose given intramuscularly or intravenously. With this treatment strychnin, $\frac{1}{30}$ grain, is given every 4 hours.

Other methods suggested are the use of normal bovine serum and a steam treatment, useful when the disease is localized.

The diagnosis of dourine by means of the conglutination method, H. WEHRBEIN (*Arch. Wiss. u. Prakt. Tierheilk.*, *43* (*1917*), *No. 2–3*, *pp. 233–238*;

abs. in Trop. Vet. Bul., 5 (1917), No. 3, p. 155).—"Nineteen dourine sera gave positive results corresponding with those given by the ordinary deviation of the complement test, and to a large extent with the agglutination test, with one exception, in which an animal that had been infected for a considerable time and had then been treated with atoxyl ceased to give a positive result with the complement test, but continued to react strongly according to the conglutination test. Thirty normal sera gave negative results, except at first in two cases where errors of technique were detected."

The author's conclusion is that the conglutination test is applicable for the diagnosis of dourine sera, but that it is more sensitive to errors and therefore more difficult to carry out than the ordinary deviation of complement method.

Studies on rinderpest, H. Schein (*Ann. Inst. Pasteur., 31 (1917), No. 11, pp. 571–592*).—This article reports a series of studies on the vaccination of cattle and buffaloes against rinderpest. The work was undertaken because of the unfavorable results with buffaloes of the usual vaccination by simultaneous injections of serum and virus. In the investigations recorded, horses were used as the experimental animals.

The earlier conclusions of Kolle and others that the virus is located in the blood corpuscles were confirmed. The virus was found, for the most part, in the leucocytes but to a slight extent in the plasma. Dilution experiments proved that 0.001 cc. of virulent blood constituted a fatal dose and 0.00004 cc. the limiting infecting dose. Virus was present in 0.1 cc. of centrifuged citrated plasma.

Experiments with specific and nonspecific serums showed that (1) the nonspecific serum of the horse has no action on the rinderpest virus, (2) the serum of certain normal cattle can attenuate or kill the rinderpest virus of the horse, (3) the antirinderpest serum probably acts upon the organism of the animal injected and not upon the microbe itself, and (4) the success of vaccination depends on the proportion of serum to virus.

The following method of vaccination of cattle and buffaloes during an epidemic of rinderpest was successfully used: The cattle received, according to size and age, from 40 to 80 cc. of serum; the buffaloes from 100 to 160 cc. Both cattle and buffaloes received 1 cc. of a dilution of virulent blood of 1 to 1,000. The diseased animal (the source of the blood) was punctured in the jugular vein with a small 2 cc. syringe and 1 cc. of blood withdrawn and placed in 1 liter of water containing 8 gm. of sodium chlorid and 2 gm. of sodium oxalate. The solution was boiled and cooled and was used within half a day. It was probable that all the animals inoculated had been infected, but very few deaths occurred in the six villages where vaccination was employed, and the epidemic was completely arrested.

The author concludes from his experience that serum infection appears to give the best results in buffaloes by injecting a sufficient quantity of serum (about 50 cc. per 100 kg. for adults and double the amount for young animals), and infecting it with the least possible amount of virus to retard the growth of the parasite.

Rocky Mountain spotted fever in California, J. G. Cumming (*Jour. Infect. Diseases, 21 (1917), No. 5, pp. 509–514, figs. 5*).—The results obtained from the inoculation of animals has definitely established the occurrence of Rocky Mountain spotted fever in California, while the finding of the tick *Dermacentor venustus* in Ventura County and the occurrence of a case there marks that region as a new area of possible prevalence of the disease in the State.

Experimental trypanosomiasis: T. equiperdum infection in the dog, E. B. Krumbhaar (*Jour. Infect. Diseases, 22 (1918), No. 1, pp. 34–42, figs. 5*).—"Dogs

may be readily infected with *T. equiperdum* and a severe anemia be produced. The incubation period varies from 3 to 8 days, and fatal termination results in from 3 to 7 weeks. By successive transmission through dogs the virulence of the infection may be increased so that both incubation period and duration of the disease may be shortened and the maximum anemia more quickly reached.

"With the appearance of trypanosomes in the circulating blood, the animals show general weakness, loss of weight, lethargy, and a lessened tendency to the healing of wounds. Subcutaneous edema is a common manifestation and may appear as a general anasarca or be limited to the genitalia or the extremities. The edema fluid contains living trypanosomes. Another interesting and almost constant lesion is keratitis. Choluria is constantly present without evidence of jaundice in the skin or mucous membrane. The anemia which develops is progressive and of the hemolytic type. The hemoglobin may fall to 40, and the red cells to less than 3,000,000 per cubic centimeter."

Complement fixation in experimental trypanosomiasis, A. C. Woods and H. H. Morris (*Jour. Infect. Diseases, 22 (1918), No. 1, pp. 43–48*).—"Dogs infected with *Trypanosoma equiperdum* develop complement fixation with a specific antigen within eight days after inoculation. An easily prepared and a very satisfactory antigen is the salt solution extract of the spleen of a rat heavily infected with trypanosomes or dead from the infection. The complement fixation usually follows the appearance of trypanosomes in the blood, although it may occasionally precede the appearance of trypanosomes. The complement fixation, however, always antedates the appearance of symptoms. Dogs infected with trypanosomes frequently give a positive Wassermann reaction.

"Within three weeks after the appearance of trypanosomes in the blood, the serum of the infected dog becomes strongly anticomplementary. This anticomplementary phenomenon appears to be due to the liberation of anticomplementary substances into the blood by the invading trypanosomes. The blood is rendered sterile, and all clinical symptoms clear up following the intravenous injection or arsenobenzol. In the only complete experiment at hand the anticomplementary action and complement fixation properties with the trypanosome and Wassermann antigens likewise disappeared."

Concerning the trypanosome of swine in the valley of the Inkissi, J. Greggio (*Bul. Agr. Congo Belge, 8 (1917), No. 1–2, pp. 148–160*).—In the valley of the Inkissi 36 of 94 domesticated swine examined were found to carry *Trypanosoma congolense*, a human trypanosome, but for them it does not appear to be pathogenic.

Studies of the tissue reactions to various products of the tubercle bacillus, P. F. Morse and Ethel Stott (*Jour. Lab. and Clin. Med., 2 (1916), No. 3, pp. 159–167, pl. 1, figs. 7*).—This article reviews the literature on the mechanism of the formation of the tubercle, the predominant theory of previous investigators being that the histological lesion caused by the tubercle bacillus is due to a poison liberated from the body of the bacillus by action of the tissue cells. The present investigations, which are described in detail, suggest that the lesion is due rather to the waxy substances of the bacillus acting as a peculiar type of foreign body.

A study of the relative efficiency of the various differential staining methods used in identifying the tubercle bacillus, N. P. Sherwood (*Kans. Univ. Sci. Bul., 10 (1917), No. 3, pp. 25–35*).—The author's investigations have led to conclusions of which the following form a part:

"There is great variation in the acid-proofness of different strains of *Bacillus smegmatis*. Even in positive sputums there is some tinctorial difference of the tubercle bacillus toward Fonte's stain, whereas with the other methods very

little if any tinctorial variations were observed. The methods of Gabbot, Ziehl-Neelsen, Pappenheim, and of Bunge and Trantenroth are not at all reliable as a means of differentiating the tubercle bacillus from the rest of the acid-fast group. Fonte's method seems to be much superior to the other methods, but not entirely reliable in urine, and even in sputum examinations. The percentage of error can only be determined by much more extensive work. The error of all of these methods seems to be that of giving too many positive results."

A note on Petroff's cultural method for the isolation of tubercle bacilli from sputum and its application to the examination of milk, F. CONSTANCE STEWART (*Jour. Expt. Med., 26 (1917), No. 6, pp. 755–761*).—The author has applied the Petroff method [1] for the isolation of tubercle bacilli from sputum to the examination of milk. The milk to be tested was digested with an equal volume of 3 per cent sodium hydroxid solution for from 20 to 30 minutes at 37° C. After neutralizing and centrifuging, inoculations from both fat and sediment layers were made on the gentian-violet-egg-meat-juice medium of Petroff.

The organism was recovered from 69.2 per cent of the samples of milk artificially infected. Of 59 samples obtained from widely different sources 5 gave positive cultures, while 29 samples from the Connecticut Bacteriological Laboratory gave negative tests. All of the organisms isolated were of the bovine type. The author believes that with slight modifications, such as the addition of certain amino acids, small amounts of sugar, and phosphates to the Petroff medium, the method should prove constant and reliable for the isolation of tubercle bacilli from milk.

Tuberculosis in equines, E. M. PICKENS (*Cornell Vet., 8 (1918), No. 1, pp. 9–25, pls. 3*).—The author has compiled from case reports and textbooks data on equine tuberculosis, including history, occurrence, source and channels of infection, symptoms, post-mortem findings, course, and diagnosis. Three typical cases are described in detail.

Infectious abortion in cows, F. M. HAYES (*California Sta. Circ. 183 (1917), pp. 4*).—A popular summary of information.

Bovine hematuria, S. HADWEN (*Jour. Amer. Vet. Med. Assoc., 51 (1917), No. 6, pp. 822–830*).—This paper deals with the symptoms and pathology of the disease and refers to experimental work.

"Injections of dilute oxalic acid solutions provoke great irritation and subsequently the urine is stained with blood. Calcium oxalate crystals are formed in the bladder as soon as the acid comes in contact with the urine and mucus. After a time the urine becomes contaminated with bacteria which no doubt play a part in aggravating and maintaining the lesions. It is probable that the acid has a direct effect on the walls of the bladder as well as the crystals. Two out of the three cases developed a disease indistinguishable from natural cases of hematuria."

The experiments are considered by the author to support the oxalic acid theory of the causation of the disease, which he advanced in the report of the veterinary director general of Canada for 1914 (E. S. R., 36, p. 179).

Redwater or bloody urine in cattle, J. W. KALKUS (*Washington Sta., West. Wash. Sta., Mo. Bul., 5 (1917), No. 9, pp. 127–129, fig. 1*).—This is a brief popular account of this disease and its treatment, a more detailed account of which by the author has been previously noted (E. S. R., 30, p. 383). As regards the cause of this disease, the author considers the oxalic acid theory of Hadwen, above noted, to be the most plausible.

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[1] Jour. Expt. Med., 21 (1915), No. 1, pp. 38–42.

Studies of an obscure cattle disease in western Nevada, W. B. MACK and E. RECORDS (*Jour. Amer. Vet. Med. Assoc., 52 (1917), No. 2, pp. 143–155*).—The authors' conclusions are as follows:

"Whatever the nature of this infection, it appears to be taken up from the intestine and carried to the liver by the portal vein, where it establishes itself, produces severe local damage, and later overwhelms the animal, either by extension into the blood stream or by the liberation of a soluble toxin.

"The original hypothesis that this is an atypical form of hemorrhagic septicemia has not been proved. The bacteriological and serological findings are rather against this theory. The clinical observations, anatomical changes, and the results of immunization and serum therapy seem to favor it."

The results of an experiment to note the effects of freezing on antihog cholera serum, H. C. H. KERNKAMP (*Cornell Vet., 8 (1918), No. 1, pp. 7–9*).—Experiments are cited which would seem to prove that freezing under conditions that would be likely to occur in transit does not destroy the immunizing properties of antihog cholera serum or render it unfit for use.

Ticks affecting big game, F. BRADSHAW (*Ann. Rpt. Dept. Agr. Saskatchewan, 11 (1916), pp. 232–235, figs. 2*).—This reports upon the infestation of moose by the winter tick (*Dermacentor albipictus*), which resulted in the death of large numbers.

RURAL ENGINEERING.

Irrigation by borders, or sloping checks, R. W. ALLEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Umatilla Expt. Farm, 1915–16, pp. 20–22*).—"A series of preliminary investigations to determine the manner in which irrigation water moves in coarse sandy soil showed that it went down very quickly in all instances and spread out to a very limited extent. In furrow irrigation it was found that when water was applied by means of furrows 2 ft. apart it moved laterally through the soil so little that a portion of the soil to a depth of 6 ft. between the furrows remained dry, although the water was run for several hours in the furrows. Water was run through shallow furrows 2 ft. apart for six days in raw land without moistening the surface soil between them. It was then found that by flooding the land it could be uniformly moistened to depths which were determined by the quantity of water applied. Level checks could not be irrigated successfully, because the water disappeared so rapidly near the box that much waste occurred unless very small checks were used, or else the head of water must be very large and so cover the ground quickly. . . .

"An experiment was begun in 1916 to determine the influence of the length of the border on the amount of water required for successful irrigation with a given head. Three borders were made, 22 ft. wide, 100, 175, and 250 ft. long, and lettered *a*, *b*, *c*, respectively. The slope in each border is uniform and relatively similar in all of them, the total fall being 1.2 ft. in *a*, 1.8 ft. in *b*, and 1.9 ft. in *c*. Twenty-one irrigations were applied during the season, using a head of water that varied from 1 to 1.5 second-feet. . . . With this head of water and width of borders the 175-ft. border is irrigated as economically as the 100-ft. one. The 250-ft. border is not so economically irrigated, but no more water was applied to it than the soil was capable of holding. However, some waste probably resulted from deep percolation near the upper end. With a larger head of water it might be irrigated satisfactorily, but 250 ft. appears to be the maximum distance the water should be run under the best conditions found on these sandy soils. With a larger head of water, which should be used in general practice, the borders could be made much wider and the number correspondingly reduced."

Surface water supply of the South Atlantic and Eastern Gulf of Mexico Basins, 1915 (*U. S. Geol. Survey, Water-Supply Paper 402* (*1916*), *pp. 51+XXX, pls. 2*).—This report presents the results of measurements of flow made on streams in the South Atlantic and Eastern Gulf of Mexico Basins during 1915, together with the usual list of stream-gauging stations and publications.

Manual for water supply in villages, R. P. Sparro (*Poso'ie dli͡a Sel'skago Vodosnabzheni͡a. Moscow: Glav. Uprav. Zemleustr. i Zemled., Otd. Zeml. Uluch., 1915, 2. ed., pp. 205, pls. 8, figs. 30*).—This book deals with ponds, dug wells, and springs as sources of water supply for villages and with machinery and apparatus for making such water available.

Bacteria in deep wells, F. W. Tanner and E. Barton (*Univ. Ill. Bul., 14* (*1916*), *No. 5* , *pp. 214–224, fig. 1; abs. in Abs. Bact., 1* (*1917*), *No. 2, pp. 156, 157; Chem. Abs., 11* (*1917*), *No. 11, p. 1706*).—This is an abstract of a thesis in which studies of the number and character of the bacteria of waters from deep wells at different points in Illinois which had been in use for some time are reported. The wells varied in depth from 113 to 895 ft., with one 2,000 ft. deep.

While no definite conclusions were drawn, it was found that "these waters, which apparently are protected against contamination, contained bacteria commonly found in water. . . . The bacteria isolated occur in shallow well water and may not have come from a deep seated water, which is perhaps sterile."

With reference to *Bacillus coli* in ground waters, an investigation was made on a series of 19 tubular wells from 80 to 125 ft. deep in alluvial sand and gravel near a river. The results of analysis showed a decided difference in composition between the water of the river and that from the wells. Gas-forming bacteria were present in 10-cc. samples of the water in more than 90 per cent of the analyses made. The 1-cc. samples were positive in 43 per cent of the determinations, but in the 0.1-cc. samples there were only nine positive tests in 62. Gas formers isolated from six samples had characteristics like those of *B. coli.* Liquefying bacteria were present in a few samples and fluorescent colonies were identified in many. Some were identified as *B. fluorescens liquefaciens* and *B. fluorescens nonliquefaciens.*

In an experimental study to determine whether surface seepage enters wells, 1 ton of fine salt was evenly divided among 11 privy vaults located near water supplies. No direct connection with pollution from surface sources was found.

Twenty-seven references to literature bearing on the subject are appended.

The factors which influence the longevity of Bacillus coli and B. typhosus in waters, M. E. Hinds (*Univ. Ill. Bul., 14* (*1916*), *No. 5, pp. 225–233*).—This is an abstract of a thesis, in which experiments are reported and the conclusion reached that "in pure, natural water and in redistilled water *B. coli* and *B. typhosus* die from starvation at a regular rate. The rate of death increases with the temperature and is similar to the rate of a chemical reaction, thus following the monomolecular law. The presence of mineral matter had no apparent effect on the organisms. The presence of oxygen under starvation conditions seems to be harmful to *B. coli* and beneficial to *B. typhosus.*"

Twelve references to literature bearing on the subject are appended.

The viability of colon-aerogenes bacteria in water, L. A. Rogers (*Abs. Bact., 1* (*1917*), *No. 1, pp. 56, 57*).—Recent work, including some unpublished results of the author, show that fecal bacteria include, in addition to the true *Bacillus coli* which is characterized by a carbon dioxid ratio of approximately 1:1, a variety of *Bacterium aerogenes* which is distinguished from the type found commonly on grains by its uniform fermentation of adonite.

In water artificially infected with feces and held at 20° C. there was a gradual change in the ratio of these two types until at the end of nine months

the relative numbers were reversed and there were 39 *B. aerogenes* to 1 *B. coli*. In sewage held in running water there was a rapid decrease of colon bacteria which was more evident in the *B. coli* than in the *B. aerogenes*. At the beginning there were about three times as many *B. coli* as *B. aerogenes* but after seven days there were slightly more *aerogenes* than *coli*.

A comparison of a collection of cultures from water with the characteristics of similar collections from human feces and from grains showed a much greater similarity between the water and fecal cultures than between the water and grain cultures. This was especially true if those cultures evidently not of fecal origin were eliminated from the water cultures and those of evident fecal origin from the grain cultures.

Samples were taken at intervals from streams known to be badly contaminated and the number of each colon type determined. In each case the aerogenes type was greatly in excess above the source of pollution, but below the sewer there were more *B. coli* than *B. aerogenes*. In one stream there were no additional sources of contamination and the ratio of *B. aerogenes* to *B. coli* found above the sewer was regained in about 10 miles. In the second case there were other sources of contamination and the ratio of the two types remained at nearly 1:1 for the eight miles observed. In this stream it was found that while nearly all of the aerogenes cultures isolated above the sewer were not adonite fermenters, below the sewer the adonite fermenters predominated.

Observations on the types of organisms isolated from water after treatment with calcium hypochlorite, M. A. Smeeton (*Jour. Bact., 2 (1917), No. 4, pp. 355–359*).—Experiments conducted at New York University with Croton River water which had been treated with calcium hypochlorite in the proportion of 1 part of chlorin to 2,000,000 parts of water showed that "the organisms found were apparently of the common saprophytic type usually found in air and water. No intestinal forms appeared to survive the treatment in the amount examined. It would appear, therefore, that available chlorin in the proportion of 1 part to 2,000,000 is sufficient to purify surface water obtained under conditions similar to that of the Croton supply."

The English incubation test for the putrescibility of sewage and sewage effluents, F. W. Mohlman (*Univ. Ill. Bul., 14 (1916), No. 5, pp. 315–324*).—This is an abstract of a thesis in which experimental work consisting of incubation tests at 20° C. with various dilutions of sewage and distilled water are reported, the purpose being to determine the value of the procedure represented and modified by the so-called Phelps formula $\log \frac{O'}{O} = KCt$. In this O = the final amount of oxygen present in the water in unit volume, C = the concentration of the sewage in percentage by volume, t = the time in hours allowed for the reaction to proceed, O' = initial amount of oxygen present, and K = a constant determined by the character of the organic matter and in turn defining the oxidizability of that organic matter.

"Most of the results indicate that the oxygen consumption is nearly complete in ten days. The variability in the amount of oxygen absorbed per liter of sewage in different dilutions is excessive. The amount of oxygen absorbed depends entirely upon the amount added and is always higher in higher dilutions. The values of K seem to be more concordant, although they are generally higher in higher dilutions. The excessive consumption of oxygen in higher dilutions may be caused by the actual loss of oxygen gas, or may be caused by the more vigorous oxidation. Whatever may be the cause, the fact remains that the method did not give consistent results in varying dilutions. If the same

dilution could always be used, the results would be of some comparative value. The biological oxygen consumption of any sewage as determined by this method, however, could not be balanced against the oxygen in a stream, since almost any value could be obtained for the sewage, depending upon the dilution used. . . .

"As a practical test, the English method of determining biological oxygen consumption is subject to very grave errors and is only applicable under limited conditions. These conditions are that the same dilution must always be used if results are to be at all comparable and that incubation must extend over at least three days at 20°. Oxygen demand for longer periods may then be calculated by Phelps's formula."

Bacteriological study of sewage purification by aeration, R. RUSSELL and E. BARTOW (*Univ. Ill. Bul., 14 (1916), No. 5, pp. 348–358*).—Investigations on the bacteriology of sewage purification by aeration brought out the following features:

"There is a large and consistent reduction of the total number of bacteria in the sewage. The actual stabilization process is due to a typical aerobic bacterial flora which gains almost complete ascendency. The other inhabitants are largely incidental. The actual nitrification is accomplished by two typical known nitrifiers, nitrosomonas and nitrobacter."

Purification of sewage by aeration in the presence of activated sludge, E. BARTOW and F. W. MOHLMAN (*Univ. Ill. Bul., 14 (1916), No. 5, pp. 325–335, figs. 5*).—Some further experiments on this process are described (E. S. R., 34, p. 591).

Handbook of clearing and grubbing: Methods and cost, H. P. GILLETTE (*New York: Clark Book Co., Inc., 1917, pp. [VI]+241, figs. 67*).—In this handbook are compiled a large amount of data on methods and costs of clearing land, much of which consists of the results of the author's broad experience along these lines. The first two chapters deal with factors affecting cost estimating and appraising and with specifications relating to methods of land clearing for roads, reservoirs, and railways and for general purposes. Other chapters deal in detail with land clearing practice in general; grubbing by hand; burning and charpitting; blasting; hand, horse, and power stump pullers; and heavy plows. A list of manufacturers of supplies and equipment for use in clearing and grubbing is included.

Tests of a large-sized reinforced-concrete slab subjected to eccentric concentrated loads, A. T. GOLDBECK and H. S. FAIRBANK (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 10, pp. 505–520, figs. 11*).—In continuation of work previously noted (E. S. R., 33, p. 487; 35, p. 290; 36, p. 788; 38, p. 289) tests on the effect of eccentricity of loading of a reinforced concrete slab 32 by 16 ft., 14 in. thick with 13 in. effective thickness, are reported. The concrete was a 1:2:4 mixture, and the slab which was built in place was supported by concrete abutments.

It was found that "to provide against the frequently realized condition of a heavy concentrated load applied near the parapet . . . the resisting moment required in the portion of a bridge slab near the outer edges is greater than that which is necessary in the central portion. Further than this, if the relation indicated above be verified and shown to include other span lengths, it would seem that in designing a slab the necessary allowance for the concentrated load near the outer edge can be made very simple in the following manner: (1) Use the formulas for narrow rectangular beams, subsituting for the breadth (*b*) the value obtained from the table for central concentrated loads [E. S. R., 35, p. 291]; (2) determine the loss in effective width due to

the assumed eccentricity of the load; and (3) supply the deficiency by designing the curb of the parapet to provide a resisting moment equal to that of a slab of width equal to the loss in effective width due to eccentricity, making allowance for the greater stiffness of the section under the parapet. Thus, suppose a slab of 16-ft. span and 20-ft. width is to be designed to carry a concentrated load of 20,000 lbs. applied at a point 4 ft. from one edge, then

$$\frac{\text{Total width}}{\text{Span}}=\frac{20}{16}=1.25$$

from the table for central concentrated loading, the effective width=0.69×16 ft.=11.04 ft. Consider the load of 20,000 lbs. to be carried by a width of 11.04 ft., use the ordinary formulas for rectangular-beam design and determine the effective depth of the slab and the area of steel required. Now, by the relation indicated above, determine the effective width with the load in the critical position 4 ft. from one edge, then

$$(be)=\frac{11.04}{2}+4=5.52+4=9.52 \text{ ft.}$$

the difference between the values of *bc* and *be* is 11.04−9.52=1.52 ft. Therefore the curb of the parapet should be so designed that it will have a resisting moment equal to that of a width of 1.52 ft. of the slab, making allowance for the greater stiffness of the parapet section. In constructing slabs designed in this manner . . . the curb of the parapet must be added before the concrete of the slab has taken initial set."

How the surface of a road affects tractive effort (*Engin. News-Rec.*, *79* (*1917*), *No. 8*, *pp. 367–369*, *figs. 5*).—Traction tests under California conditions are reported with a standard farm wagon equipped with steel axles of equal length and 38- and 46-in. wheels, all wheels having 4-in. tires. The gross load was 3 tons, and the speed was kept close to 2.4 miles per hour. Typical results are summarized in the following table:

Tractive resistance for various road surfaces.

Kind of road.	Condition of road.	Tractive resistance.	
		Total.	Per ton.
		Lbs.	*Lbs.*
Concrete (unsurfaced)	Smooth, excellent	83.0	27.6
Concrete (unsurfaced) (load apparently accelerated when test was started).	....do	90.0	30.0
Concrete (⅜-inch surface, asphaltic oil and screenings).	....do	147.6	49.2
Do	....do	155.0	51.6
Macadam (water-bound)	....do	193.0	64.3
Topeka on concrete	....do	205.5	68.5
Gravel	Compact, good condition	225.0	75.0
Oil macadam (drawn with motor truck at 2½ miles per hour).	Good, new	234.5	78.2
Oil macadam (drawn with motor truck at 5 miles per hour).	....do	244.0	81.3
Gravel	Packed, in good condition	247.0	82.3
Topeka on plank	Good condition, soft, wagon left marks.	265.0	88.3
Earth road	Firm, 1½ in. fine loose dust	276.0	92.0
Topeka on plank	Good condition, but soft	278.0	92.6
Earth road	Dust ¾ to 2 in	298.0	99.3
Earth	Mud, stiff, firm underneath.	654.0	218.0
Gravel	Loose, not packed	789.0	263.0

"The resistance encountered on oiled surfaces was considerably more than on concrete. . . . The base supporting oiled surfaces affected the amount of tractive effort required. For example, tests . . . in which a concrete base was in-

volved showed less resistance than tests . . . in which the surface was on plank."

The tests were made under the supervision of the agricultural engineering division of the University of California in cooperation with the California Automobile Association.

Charts for the use of road-oil inspectors, E. E. Glass (*West. Engin., 8 (1917), No. 9, pp. 350, 351, figs. 5*).—These five charts give data on volume of cylinders, contents of partly filled horizontal tanks, spread of ⅜ and ½ gal. per square yard, and thermal corrections for road oil.

A kerosene carbureter, T. C. Menges (*Gas Engine, 19 (1917), No. 7, pp. 316–318, fig. 1*).—This article describes a kerosene carbureter for a throttle-governed engine and gives a mathematical discussion of the design for a particular size of engine. Experiments are also described to determine the proper location of the kerosene nozzle in the inlet pipe.

It is concluded that in order to operate successfully on kerosene it is necessary to heat up the mixture and keep it hot until it is exploded. Water must be admitted to the mixture in proportion to the work being done, and the engine must be throttle governed. The inlet orifice should be as small as possible in order to break up the liquid kerosene, and means must be provided for starting the engine on gasoline and gradually switching from gasoline to kerosene.

A laboratory manual in farm machinery, F. A. Wirt (*New York: John Wiley & Sons, Inc., 1917, pp. XXII+162, figs. 42*).—This manual is intended as a laboratory guide which will not be affected to an appreciable extent by ordinary changes in farm machinery construction. It is considered suitable for university students, and is arranged with the idea in mind that the questions asked will lead students to draw their own conclusions as to which machines are best adapted to the various agricultural conditions.

Part 1, Farm Field Machinery, contains chapters on machinery used in preparing the soil, seeding, cultivating, grain and corn harvesting, hay harvesting, pumping, and miscellaneous work. Part 2, Power Farming Machinery, contains chapters on power drawn and belt driven machinery. Part 3, Farm Mechanics, contains chapters on rope, belts, babbitting, soldering, and pipe cutting. The largest section on a single subject is that devoted to rope, which includes discussions of methods of preventing the untwisting of rope ends, loops at the rope ends and between the ends, knots for tying ropes together, hitches, halters, and block and tackle.

Instructions to students and exercises are also included.

Markets for agricultural implements and machinery in Chile and Peru, F. H. von Motz (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Spec. Agents Ser., No. 142 (1917), pp. 48*).—This report deals with the markets for agricultural implements and machinery in Chile and Peru. It is stated that the west coast markets are distinctly less promising than those of the farming countries in the eastern part of South America.

Heat losses through buildings and building materials, R. S. Hawley (*West. Engin., 8 (1917), No. 9, p. 344, fig. 1*).—Graphic data are given on heat loss through building materials which may be of value in designing farm buildings and their heating systems.

Fire prevention and fire fighting on the farm, H. R. Tolley and A. P. Yerkes (*U. S. Dept. Agr., Farmers' Bul. 904 (1918), pp. 16, figs. 2*).—The preventable nature of most farm fires is pointed out, and means of fire prevention and fire fighting are described.

RURAL ECONOMICS.

Farm management and farm profits on irrigated land in the Provo area (Utah Lake Valley), L. G. Connor (*U. S. Dept. Agr. Bul. 582* (*1918*), *pp. 40, pls. 4*).—This report is based on a study made in 1914 of 104 farms in the Provo area, Utah, in continuation of work previously noted (E. S. R., 31, p. 689). The author comes to the following conclusions:

"The size of the farm business, type of farming followed, and the diversity of income, each has an important bearing on profits. As regards size, the labor income from 26 small fruit farms and general farms [16.48 acres] averaged $350; for 29 large fruit and general farms [77.2 acres], $598; and for 20 live stock farms [106.65 acres], $1,394. As regards type of farming, the labor income of 16 small fruit farms averaged $302; of 18 small general farms, $383; of 17 large fruit farms, $611; and of 24 large general farms, $646. Eighteen dairy farmers made an average labor income of $1,427, and three small poultry farms averaged $483.

"The greatest need of the small farmers in this district is more land to work. Failing this, outside labor is a necessity if a good living is to be secured. . . .

"In general, so far as practicable, the farmer taking more land should do so by rent or lease, rather than purchase subject to a mortgage, as he can usually secure the use of the land for little more than half what must be paid on a mortgage. The money saved can be used for subsequent purchase. This, of course, does not apply to the man with cash in hand for immediate purchase.

"Some operators live in town and travel many miles a day to and from the farms. From a farm-management viewpoint this is an inefficient system.

"With land values and labor cost so high, and the marketing situation so complicated, farmers in this area should make every effort to keep at the maximum that part of the family living which is secured directly from the farm. The garden should be one of the regular enterprises and should be given adequate care.

"A further increase in the number of very small farms in this region would seem to be unwise. The operators of such units have not enough land to keep them busy at profitable work. About 30 acres seem to be the smallest size for efficient management without much reliance on live stock. Forty to fifty, preferably about 50 acres, seem to be the smallest unit for efficient management where live stock enterprises are given a prominent place by the typical farmer. This is especially true of dairying. . . .

"In general, owing to market conditions, the proper place for orchard and truck products in this region is on general farms where they are used as fillers in the business as a whole. Certainly fruit should be produced only on farms where the orchard enterprises are supplemented in a substantial way by more extensive activities. The general farms which grow truck and fruit as secondary enterprises approximate the ideal cropping combination for this region."

The organization of the farm business for profit, G. N. Dagger and J. I. Falconer (*Agr. Col. Ext. Bul.* [*Ohio State Univ.*], *13* (*1917–18*), *No. 3, pp. 29, figs. 17*).—This bulletin discusses the factors to be considered in choosing the type of farming to be followed and in organizing farm business for profit. The text is illustrated with data obtained from Ohio farms.

International yearbook of agricultural legislation (*Inst. Internat. Agr.* [*Rome*], *Ann. Internat. Lég. Agr., 6* (*1916*), *pp. LXXXI+1458*).—By adding new laws, this volume continues the information previously noted (E. S. R., 36, p. 393).

Laws of Maine relating to agriculture (*Bul. [Maine] Dept. Agr., 16 (1917), No. 4, pp. 112*).—This bulletin continues information previously noted (E. S. R., 22, p. 595) by adding information of later date.

The laws of South Dakota establishing a system of rural credits (*Rural Credit Bd. [S. Dak.] Circ. 1 (1917), pp. 12*).—This pamphlet contains the text of the act establishing a system of rural credits, approved February 26, 1917.

Cheaper money for Saskatchewan farmers (*Saskatchewan Dept. Agr. Bul., 47 (1917), pp. 7*).—This pamphlet contains a brief statement regarding the Saskatchewan farm loan act, and points out the nature of the loans, methods of making payments, and purchase of the farm loan bonds.

Live stock on credit terms to Saskatchewan farmers, and the cooperative marketing of live stock and live stock products, butter, wool, poultry, etc. (*Saskatchewan Dept. Agr. Bul. 45 (1917), pp. 20*).—These pages describe the method of distributing live stock under the provisions of the Saskatchewan live stock purchasing and sales act, and indicate the various steps in distribution and finance, selling, organizing, and establishing creameries, and the establishment of cooperative live stock marketing associations, wool associations, and cooperative poultry-killing and marketing associations.

Farmers' market bulletin (*North Carolina Sta., Farmers' Market Bul., 4 (1917), Nos. 17–19, pp. 8 each*).—These bulletins contain the usual lists of growers having produce and live stock for sale, indicating quality, shipping date, and variety and breed.

Suggestions to purchasers of farm lands in New York, E. O. Fippin (*N. Y. State Col. Agr., Cornell Ext. Bul. 23 (1917), pp. 58–78, figs. 22*).—This publication describes the general characteristics of farm land in New York State, indicates some reasons for the wide range in prices of land, and points out some of the facts relating to agricultural development and social conditions.

Economics of agricultural production in South Africa, R. A. Lehfeldt (*So. African Jour. Indus., 1 (1917), Nos. 1, pp. 35–43; 2, pp. 105–112*).—In these pages are discussed the present system of agricultural production in South Africa and the possibility of introducing sugar plantations.

Condition and movement of agricultural laborers and rural population in France in 1913–14, L. Dugé de Bernonville (*Statis. Gén. France, 6 (1917), No. 3, pp. 295–330, figs. 2*).—These pages discuss the extent of the movement of people from one part of the country to another, the influence of the number of births upon the increase and decrease in population, the proportion of those on farms who are owners, operators, and laborers, and the extent of the movement of people from the rural districts and of the decrease in the number of families. The question of rural health is also touched upon.

The world's food (*Ann. Amer. Acad. Polit. and Soc. Sci., 74 (1917), No. 163, pp. [8]+301, figs. 20*).—This number contains a series of papers relating to the world's food, covering such topics as the food situation in various countries, its utilization and conservation, plans for production and marketing for the coming year, and price control.

The corn trade during the war, C. Kains-Jackson (*Jour. Roy. Agr. Soc. England, 3. ser., 76 (1915), pp. 49–73*).—These pages give statistical data showing the imports into the United Kingdom of grain during the years 1913 and 1914–15, indicating the source, amount, and price.

The corn and meat trades since the war (*Jour. Roy. Agr. Soc. England, 3. ser., 77 (1916), pp. 62–78*).—W. Weddel & Co., Ltd., give data which continue those noted above by adding statistics for the year 1915–16, and also information regarding the meat trade during the war.

Prices and supplies of corn, live stock, and other agricultural produce in England and Wales (*Bd. Agr. and Fisheries* [*London*], *Agr. Statis. 51* (*1916*), *No. 3, pp. 62–93*).—This bulletin continues data previously noted (E. S. R., 36, p. 393), by adding statistics for 1916.

Agricultural statistics of Chile (*Statis. Abs. Chile* [*1916*], *pp. 78–93*).—This report contains data showing by provinces for 1916 the number of farms, area classified as to irrigation or nonirrigation, and the area under the principal crops and their yields, with comparative data for similar items for previous years.

Agricultural statistics of Uganda Protectorate (*Ann. Rpt. Dept. Agr. Uganda, 1917, pp. 42–45*).—These pages contain data showing by provinces and districts for 1916–17 the number of live stock by classes and the extent of crops possessed by the natives and by foreigners.

AGRICULTURAL EDUCATION.

Departmental organization in agricultural teaching, F. H. Blodgett (*School and Soc., 6* (*1917*), *No. 154, pp. 668–672*).—The author calls attention to the lack of correlation between the scientific and practical fields of college subjects, especially noticeable in biology and agriculture. He discusses from the point of view of organization of the teaching force, rather than the relation of the topics taught, the grouping of work into divisions of closely related topics, to include both pure or theoretical and applied phases of the several subjects. In his opinion, this should effect a closer coordination of work and procedure than if the divisions are based only on the final utility of the work.

The scope and methods of instruction in rural sociology, J. M. Gillette (*Pubs. Amer. Sociol. Soc., 11* (*1916*), *pp. 163–180*).—The author defines rural sociology and discusses the scope of instruction in this subject, including as the more important centers of interest, rural responses to physical interests, population, production in the economic sense, communication, health, neighborhood institutions and organizations, pathological social conditions of country life, the psychology of the rural social mind, semirural and town-country communities and their problems, the relation of country to city, and investigations and surveys. He also sketches the more important methods of instruction found profitable in this field, viz, text and lecture work, the study of rural surveys, and investigations.

The value of a technical education to a forest supervisor (*Yale Forest School News, 5* (*1917*), *No. 4, pp. 52–56*).—This is a series of articles edited from letters received in general correspondence with forest supervisors with reference to their opinion as to the value of their forest school training for the work they are now doing.

There seems to be a general opinion that, inasmuch as at the present time the forest supervisor's duties lie more along the lines of a business manager than a technical forester, so far as direct utilization goes only a little of the forest school training has applied specifically, a little mensuration, a little applied silviculture, a good deal of surveying and engineering—about what could be acquired in a six months' selected course. It is pointed out, however, that the great value in the forest school training is the establishment of a background, the fixing of ideals to work toward. While there are many very valuable men in the service who have never had a forest school training, the demands of the future will be such as to make such training an extremely valuable asset. The forest supervisor should have clearly in mind the broad and basic principles upon which to build a régime and a forest wisely and con-

servatively used. A technical forestry training also gives the supervisor a broader outlook, enabling him better to realize the possibilities of his forest and resulting in less danger of having the forest looked upon as something reserved rather than something to be properly used. There is also the pleasure derived from the knowledge of plant and animal life and of silvicultural subjects.

Elementary science, J. G. Coulter (*New York: Charles Scribner's Sons, 1917, pp. VIII+289, figs. 107*).—This text includes the following chapters relating to agriculture: Water and agriculture, origin of soil, kinds of soil, fertility and soil life—bacteria, food—the nutritive cycle, plant life, the story of seeds, plant groups, relations between plants and their surroundings, and insects.

The author has adopted the colloquial method of presentation, accompanied by more or less repetition, since it proved to be the most effective as tested by many trials with classes.

Productive agriculture, J. H. Gehrs (*New York: The Macmillan Co., 1917, pp. XIV+436, figs. 245*).—The author's object in writing this book is to standardize seventh and eighth grade agriculture in the rural schools. It is intended to meet the demands of the courses of study of the north central States and treats of the origin, history, importance, distribution, varieties, breeds, conditions, cost, and methods of production; how to increase production; harvesting, and uses of farm crops and animals, including poultry; soils and their improvement, horticulture, including plant propagation, vegetable gardening, fruit growing, and the farmer's wood lot; and farm management, including the choosing and planning of a farm, farm bookkeeping, farm labor, and the relation of animal husbandry to permanent agriculture. The chapters, each of which is followed by laboratory exercises, are arranged to conform as closely as possible to the farmer's seasonal occupations. A list of apparatus and equipment, with approximate cost, and a brief bibliography are included.

Courses in secondary agriculture for southern schools (third and fourth years), H. P. Barrows (*U. S. Dept. Agr. Bul. 592 (1917), pp. 40*).—Continuing previous work (E. S. R., 37, p. 395), this bulletin outlines (1) one unit of instruction in horticulture, including plant propagation, fruit growing, home floriculture, home-ground improvement, and vegetable gardening, for the third year; and (2) one-half unit of instruction in rural engineering, including farm machinery, farm structures, farm sanitation, agricultural surveying, farm drainage, irrigation, terracing, roads, and rope work, and one-half unit in rural economics and farm management, for the fourth year. The distribution of time and credits, elective courses, practicums, projects, illustrative material, texts, and references, and equipment are suggested.

The farmer and his friends, Eva M. Tappan (*New York: Houghton Mifflin Co., 1916, pp. VI+106, figs. 15*).—This book, intended as a reader for the grammar grades, compares the old agriculture and the new, and contains information concerning the help given by the Federal and State Governments in teaching the farmer, the production of sugar, the growing, harvesting, storing, and uses of potatoes, apples, wheat, rice, oranges, raisins, flax, and cotton, bees and their work, raising chickens, the care and shearing of sheep, the care of cows, the handling of milk and the production of butter and cheese, and a logging camp.

Judging sheep as a subject of instruction in secondary schools, H. P. Barrows (*U. S. Dept. Agr. Bul. 593 (1917), pp. 30, figs. 23*).—This bulletin, intended for teachers, includes (1) an outline of classroom instruction in judging sheep, comprising the use of illustrative material, a study of types and breeds,

market classes and grades, the relation of type to efficiency, and the score card; (2) a description of mutton sheep; and (3) suggestions on practice judging.

A simple course in home economics for rural schools, MARY E. GEARING, JESSIE P. RICH, and M. MINERVA LAWRENCE (*Bul. Univ. Tex., No. 49 (1916), pp. VIII+9–162, figs. 5*).—These lessons have been specially prepared to meet the needs of the small schools in which a special teacher and expensive equipment are not as yet possible. The course is intended to give pupils an intelligent understanding of the composition of foods, their value and uses in the body, and the proper combinations and amounts necessary for a well-balanced diet, and to enable them to prepare and serve wholesome and attractive dishes at the minimum expenditure of time, labor, and money. Each lesson consists of subject matter, references to literature, a plan for teaching and correlating with other school subjects, and recipes. A plan for the practical application of the work to solve the question of the noon lunch is suggested. Two lists of cooking equipment for the 1-room rural school, costing, respectively, $6.50 and $18.50, are included.

MISCELLANEOUS.

Biennial Report of Connecticut Storrs Station, 1914–15 (*Connecticut Storrs Sta. Rpt. 1914–15, pp. IX+302+253–274, figs. 116*).—This contains the organization list, a financial statement for the fiscal years ended June 30, 1914, and June 30, 1915, a report of the director, and reprints of Bulletins 80–89, previously noted. Meteorological data for 1914 and 1915, noted on page 416, are appended.

Thirtieth Annual Report of Vermont Station, 1917 (*Vermont Sta. Bul. 208 (1917), pp. 16*).—This contains the organization list, a brief announcement concerning the station, a financial statement for the fiscal year ended June 30, 1917, and a report of the director on the publications and work of the station.

The work of the Umatilla Reclamation Project Experiment Farm in 1915 and 1916, R. W. ALLEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Umatilla Expt. Farm, 1915–16, pp. 39, figs. 3*).—This report includes a summary of meteorological observations from 1912 to 1916, a review of climatic and agricultural conditions on the project, and a report of the work on the experimental farm during 1915 and 1916. The experimental work reported is for the most part abstracted elsewhere in this issue.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta., Mo. Bul., 5 (1917), No. 9, pp. 125–140, fig. 1*).—This contains brief articles on the following subjects: The Activities of the Office of Farm Markets, by A. Hobson; Redwater or Bloody Urine in Cattle, by J. W. Kalkus (see p. 486); Fertilizer Saving by Improved Stable Methods, by H. L. Blanchard; Increasing Crop Production by Drainage, by E. B. Stookey; Maintenance of Egg Production During Winter, by Mr. and Mrs. G. R. Shoup; The Adaptability of the Tractor to the Smaller Farms, by J. P. Fairbanks; Getting Rid of Rats; and Farmers' Winter School.

Index to General Bulletins 1 to 25, H. B. CLEES (*Washington Sta., Index Gen. Buls. 1–25 (1917), pp. 12*).—This is a combined subject and author index.

Index (*Hawaiian Sugar Planters' Sta., Div. Ent. [Pamphlet], pp. 8*).—An index to Volume 3, comprising Bulletins 6–13.

Two methods of orientation of small objects in paraffin, J. A. NELSON (*Science, n. ser., 46 (1917), No. 1190, p. 387*).

NOTES.

Arkansas University.—E. B. Mathew, head of the department of agricultural education in the Fort Hays (Kans.) Normal School, has been appointed head of the department of agricultural education.

Kansas College and Station.—N. L. Harris, superintendent of the poultry farm, has resigned to become poultry specialist in the extension division of the University of Arizona and has been succeeded by Harold H. Amos. W. S. Latshaw, assistant in soil analysis, has been appointed assistant professor of chemistry and will take charge of certain lines of analytical work in the station. R. W. Titus, instructor in chemistry, has been transferred to the station as assistant chemist and has been succeeded by H. E. Fowler. C. A. A. Utt, in charge of analytical work on foods and dairy products, has resigned to engage in commercial work in Baltimore, Md.

Massachusetts College.—Alfred G. Lunn, instructor in poultry husbandry, resigned March 1 to become head of the newly established poultry department at the University of British Columbia.

Minnesota University and Station.—Recent appointments include I. D. Charlton, professor of agricultural engineering at the Washington College, as professor of farm engineering and chief of the newly established division of farm engineering; R. O. Westley as assistant professor of agronomy; and A. M. Christensen as instructor in farm crops at Crookston. W. W. Cumberland has been appointed chief of the division of research in agricultural economics and agricultural economist of the station, effective August 1.

F. L. Kennard, agronomist, and O. M. Kiser, instructor in farm crops at Crookston, have resigned. Leave of absence has been granted to E. C. Stakman, associate plant pathologist, to direct work for the control of cereal rusts in the upper Mississippi Valley; W. D. Valleau, research assistant in fruit breeding; and D. O. Spriestersbach, research assistant in agricultural biochemistry.

Missouri University and Station.—An apportionment of State funds for the calendar year 1918 has been made as follows: Agricultural laboratories, $3,000; short winter course, $11,000; agricultural engineering, $1,000; animal husbandry, $7,500; dairy husbandry, $2,500; entomology, $500; farm management, $1,000; horticulture, $1,500; poultry husbandry, $750; rent on farm lands, $1,000; pure bred live stock, $500; repairs and improvements on barns, $500; for the station, $15,000; soils department, $500; soil survey, $6,500; soil experiment fields, $5,325; farm crops experiment fields, $4,675; agricultural extension, $32,500; and to promote the growing of improved corn, $1,500.

The second term of the 1917–18 session of the short winter course in agriculture closed March 1. In spite of war conditions the enrollment was not seriously curtailed, the total of 182 students for the two terms being about 10 per cent less than for the previous year. An unusual amount of interest was manifested in the course, and the enrollment for the next session is expected to be considerably larger.

P. H. Ross, county agent leader for the State, has been appointed assistant director of the agricultural extension service. George W. Hervey, assistant in poultry husbandry, has received leave of absence for the period of the war, his

work being taken up by E. L. Dakan. T. J. Talbert, extension entomologist, has also been given leave of absence during the war to serve as executive secretary for the Federal Food Administrator of Missouri. D. A. Spencer, assistant professor of animal husbandry and assistant animal husbandman at the college and station, has been appointed to take up special work in sheep husbandry in the agricultural extension service.

Nebraska University and Station.—Dr. L. Van Es, dean of the veterinary division of the North Dakota College and acting director of that station at the present time, has been appointed in charge of the department of animal pathology beginning July 1. Laboratories for the department are shortly to be erected at a cost of from $60,000 to $100,000, and a special State appropriation is also available for research in animal diseases.

E. E. Brackett, associate professor of agricultural engineering, and I. D. Wood, extension assistant professor of agricultural engineering, have been granted leave of absence for war service as first and second lieutenant, respectively, in the aviation section. Howard N. Colman resigned as instructor in dairy husbandry, March 1, to become superintendent of the advanced registry work at the Washington College, and has been succeeded by M. N. Lawritson.

Cornell University.—Miss Martha Van Rensselaer has received leave of absence from the department of home economics to become director of the division of home economics of the U. S. Food Administration, beginning early in March.

Cecil C. Thomas has resigned as instructor in botany to accept a position with the plant disinfection work of the Federal Horticultural Board.

Ohio State University.—S. M. Salisbury has resigned as assistant professor of animal husbandry to become agricultural agent for Medina County.

Oregon College and Station.—John Martin, superintendent of the Belle Fourche substation of the Bureau of Plant Industry in South Dakota, has been appointed superintendent of the Harney substation, vice L. R. Breithaupt, resigned to engage in farming. J. E. Cooter has resigned as instructor in soils to become instructor in agriculture in a Portland high school and supervisor of school gardens in that city.

Porto Rico Insular Station.—Because of the shortage of funds in the Insular treasury, the act recently passed for the reorganization of the station will not go into effect before July 1. This act establishes a number of new positions in the divisions of plant pathology, chemistry, entomology, and horticulture, as well as providing for 2 agricultural inspectors and 10 subinspectors.

W. V. Tower resigned as director in December, 1917, and has become entomologist in the Federal Station at Mayaguez. He has been succeeded by E. Colón. Leave of absence has been given R. T. Cotton, entomologist, and he is attending an officers' training camp at San Juan. R. C. Rose, assistant pathologist, is on leave of absence as a lieutenant in the Reserve Officers' Corps. Luis Davilá, assistant entomologist, has resigned to enter commercial work.

Clemson College.—Dr. Wilson Gee, professor of biology at Emory University, has been appointed assistant director of extension work.

Utah Station.—J. W. Jones of the Office of Cereal Investigations of the U. S. Department of Agriculture, who has been superintendent of the Nephi substation for several years, has been transferred to the rice experimental farm at Biggs, Cal. The vacancy will be filled by Aaron F. Bracken, formerly assistant agronomist of the station and recently a county agent in the State. Irving J. Jensen has been appointed assistant agronomist, vice N. I. Butt resigned to engage in farming.

Vermont University and Station.—George F. E. Story, head of the department of animal and dairy husbandry, has resigned to become director of the Worcester County (Mass.) Farm Bureau.

Wyoming University.—J. D. McVean, who has been on pig club work with the Bureau of Animal Industry, U. S. Department of Agriculture, has accepted a position as extension worker in animal husbandry beginning April 1.

Experiment Station Record.—E. H. Nollau, specialist in agricultural, biological, and physiological chemistry, has resigned to engage in commercial research on dyes. He has been succeeded by Miss Sybil L. Smith, head of the department of chemistry in Milwaukee-Downer College.

Cuban Experiment Station.—Dr. Mario Calvino, formerly chief of the department of horticulture in the Central Experiment Station of Mexico, has been appointed director.

Farm School and Experimental Work in Uruguay.—A decree of October 16, 1917, of the Uruguayan Government, provides for a school for farm foremen to be opened at the National Nursery and Poultry Farm maintained by the Government at Toledo. A maximum of 20 pupils over 16 years of age, who must come from poor families and know how to read and write, will be admitted. The 2-year course which will be offered will include tree nursery and orchard work, general farming, pastures, vineyards and wine making, poultry raising, apiculture, and hog raising.

Experimental studies are to be initiated at once with soil mixtures for potting and transplanting, sizes of pots and packing, the economic and feeding value of native forage plants, the extension of plantations of yerba mate (Paraguayan tea), and the manufacture of starch and alcohol. The commission in charge of the nursery is authorized to apply $2,585 from the receipts of the establishment to the installation and maintenance of the school during the period from November, 1917, to June, 1918.

New Journals.—*The Scottish Journal of Agriculture* is being issued quarterly by the Board of Agriculture of Scotland. It is patterned closely after *The Journal of the Board of Agriculture* of England, consisting of general articles, a review of recent periodical literature, official notices, statistics, etc. The initial number contains a description of the important Corn Production Act of Great Britain. This act took effect in Ireland, August 21, 1917, and will become effective in England, Scotland, and Wales a year later, and continues in force until 1922. It supplements the Defense of the Realm Act, and provides for minimum prices on wheat and oats through a system of subsidies, fixes minimum wages for farm laborers, restricts the raising of agricultural rents, and confers sweeping powers upon the authorities to enforce proper cultivation of lands to insure good husbandry and maximum food production.

The *Voorhees Farmer* is being published at Rutgers College by the E. B. Voorhees Agricultural Society, as a medium for reaching the progressive farmers in the State in a practical way. The initial number contains several articles by the members of the college and station staff, including one by Director Lipman, entitled The Service Rendered to the Farmers of New Jersey by Their Agricultural Experiment Station and College.

The *South African Journal of Industries* is being issued by the Department of Industries as an official organ for the advancement of the industrial interests of the Union of South Africa. The initial number contains articles on The Economics of Agricultural Production in South Africa, The Increase of Food Production, South African Buchu, etc.

The International Institute of Agriculture has established a publication supplementary to the Monthly Bulletin of Statistics and known as *Documentary Leaflets*. This will embody scattered data relative to yields, trade, stocks, prices, freight rates, etc., especially of such crops as rubber, cocoa, tea, and jute.

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V

THE AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES.

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U. S. DEPARTMENT OF AGRICULTURE

STATES RELATIONS SERVICE

A. C. TRUE, DIRECTOR

Vol. 38 ABSTRACT NUMBER No. 6

EXPERIMENT STATION RECORD

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1918

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LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

[1] Printed in scientific and technical publications outside the Department.

U. S. Department of Agriculture—Contd.

EXPERIMENT STATION RECORD.

Vol. 38. Abstract Number. No. 6.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The chemistry of colloids (*New York: John Wiley & Sons, Inc., 1917, pp. VII+288, figs. 39*).—Part 1 of this volume, by R. Zsigmondy, consists of a translation, by E. B. Spear, of the German edition (E. S. R., 28, p. 407). In part 2, by E. B. Spear, certain industrial applications of colloidal chemistry are discussed, including smoke, rubber, tanning, milk, colloidal graphite, and clays. The book closes with a chapter on Colloids in Sanitation, by J. F. Norton, in which purification of wastes and sewage and the mechanism of disinfection are discussed.

Outline of colloid chemistry, I–III, W. D. Bancroft (*Jour. Franklin Inst., 185 (1918), Nos. 1, pp. 29–57; 2, pp. 199–230; 3, pp. 373–387*).—Part 1 of this paper discusses adsorption of gases, liquids, and solids, including the following topics: Catalytic action of solids on gases, adsorption of gases and vapors by solids and by liquids, adsorption of liquids by solids and by liquids, and adsorption of solids by solids and by liquids. Phenomena illustrating each phase of adsorption are noted.

Part 2 discusses adsorption from solution and coalescence under the following heads: Adsorption from solution by solid, the adsorption isotherm, abnormal adsorption, negative adsorption, reversibility of equilibrium, specificity of adsorption, adsorption of several solutes, adsorption from solution by liquid, adsorption and surface tension, Brownian movements, coalescence of liquids, coalescence of solids, and plasticity.

Part 3 discusses the preparation of colloidal solutions, including types of precipitates, theory of peptization, condensation methods, and dispersion methods. Under condensation methods there are two subdivisions, in which the stability is due chiefly to the presence of strongly adsorbed substances or chiefly to the low concentration of agglomerating agents. Under dispersion methods the subdivisions are disintegration by removing an agglomerating agent, by adding a peptizing agent, by mechanical methods, by electrical methods, and by electrochemical methods.

On the swelling of gelatin in polybasic acids and their salts, M. H. Fischer and Marian O. Hooker (*Jour. Amer. Chem. Soc., 40 (1918), No. 1, pp. 272–292, figs. 14*).—Experiments are described showing the amount of water absorbed by gelatin discs immersed in different concentrations of the primary, binary, or tertiary salts of phosphoric, citric, and carbonic acids. The swelling varied not only with the salt but with its concentration.

In further experiments on the absorption of water from phosphate, citrate, and carbonate mixtures varying from the pure acid through the mono-, di-, and tri-sodium salts to pure sodium hydroxid, the results yielded a V-shaped or U-shaped curve showing a progressive increase in water absorption to the left or to the right as the acid or alkali content of the mixture was increased.

"These findings are held to be applicable to the problem of water absorption by protoplasm and to sustain the old contention that even in the presence of buffer salts there is an increase in water absorption (increased turgor or edema) with every increase in the acid (or alkali) content of the protein colloids found in the involved cell, organ, or organism."

On the swelling of fibrin in polybasic acids and their salts, M. H. Fischer and M. Benzinger (*Jour. Amer. Chem. Soc., 40 (1918), No. 1, pp. 292–303, figs. 6*).—The experiments noted above were repeated using a different protein, fibrin. The results showed a difference in the minimal swelling point for the two proteins, a point which should be kept in mind in a study of biological material representing a mixture of proteins.

It is the opinion of the authors that the results of these studies emphasize the importance of acids, alkalis, and salts in determining the amount of water absorbed by protoplasm under physiological and pathological conditions. "Through the accumulation or production in protoplasm of an abnormally great amount of acid (or of alkali), we are thus enabled to explain the mechanism by which the abnormally high hydrations of living cells are brought about, such as are observed in the excessive turgors of plant tissues and in the edemas which involve the animal body."

On the liquefaction or "solution" of gelatin in polybasic acids and their salts, M. H. Fischer and W. D. Coffman (*Jour. Amer. Chem. Soc., 40 (1918), No. 1, pp. 303–312, figs. 3*).—Experimental data are given to prove that the swelling of a protein colloid and its liquefaction or solution are totally different processes. "There is a progressive increase in the tendency of gelatin to go into solution in mixtures of the salts of polybasic acids as the amount of acid or alkali in these mixtures is increased from a given low point."

The article closes with a discussion of the bearing of the experiments upon the changes observable in living cells subjected to direct or indirect acid intoxication and upon the problems of digestion and autolysis.

On the diastatic decomposition of inulin in chicory root, J. Wolff and B. Geslin (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 19, pp. 651–653*).—Continuing the observations on inulin previously noted (E. S. R., 36, p. 127), the authors have examined the progressive changes in the inulin of chicory root on standing and conclude that the decomposition of the inulin is a continuous process under the influence of diastatic agents until hexoses are reached. They have chosen the name "inulides" for the intermediary products and point out the resemblance between the inulides and the different dextrins. Three groups of inulides have been identified corresponding to the action of three different yeasts.

The hydrolyzing action of chicory juice on the inulides contained in the juice is due to a diastase seemingly identical with the sucrase of yeast, as the same results have been obtained by treating either inulides or a solution of sucrose with yeast or with fresh chicory juice. Both of these hydrolyzing agents are without action on pure inulin.

The influence of glycerin on the activity of invertase, É. Bourquelot (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 17, pp. 567–569; Jour. Pharm. et Chim., 7. ser., 17 (1918), Nos. 3, pp. 65–71; 4, pp. 113–117*).—Experimental data are given proving that the activity of invertase is weakened by glycerin.

Whether this effect is due to a progressive destruction of the ferment or to a particular inhibiting action of the glycerin has not yet been determined.

Toxic and antagonistic effects of salts on wine yeast (Saccharomyces ellipsoideus), S. K. MITRA (*Univ. Cal. Pubs. Agr. Sci., 3* (*1917*), *No. 5, pp. 63–102, figs. 14*).—In the investigations reported the toxic effects of single salts and the antagonistic effects of combinations of salts on the growth of yeast were studied. The yeast *S. ellipsoideus* was selected on account of its universal use in wine making. The salts tested were the chlorids of potassium, magnesium, calcium, and sodium, selected because their metallic ions are those most abundant in the ash of grape juice. The nutrient solution was prepared from hydrolyzed cane sugar, phosphoric acid, and ammonia. To 100 cc. of the solution was added the salt or combination of salts under investigation in various strengths of molecular concentration from 0.001 to 2.2M. After inoculation with 1 cc. of a pure culture of the yeast, the flasks were kept in an incubator at 28° C. The activity of the yeast was determined by the multiplication of cells noted at intervals of 48 hours for a period of 12 days.

The toxic effects of the single salts were as follows: (1) Each of the four single salts is more or less toxic to the yeast. At a certain concentration potassium chlorid is the least toxic and sodium chlorid the most. (2) The lower concentrations of each salt stimulate, the higher concentrations inhibit, the growth of yeast. The optimum concentrations for growth were found at 0.2M KCl, 0.1M $MgCl_2$, 0.01M $CaCl_2$, and 0.001M NaCl. The lowest concentrations at which growth was inhibited were at 2.2M KCl, 1.2M $MgCl_2$, 0.7M $CaCl_2$, and 0.2M NaCl. (3) The results are quite different from those found by other investigators with either bacteria, the higher plants, or animals, yeast standing midway between plants and animals. (4) Toxicity is also shown by a decrease in the size of the yeast cell with higher concentrations of the salts.

The antagonistic effects of combinations of the different salts in pairs were found to be in the following order from highest to lowest: $MgCl_2$ *v.* $CaCl_2$, KCl *v.* $CaCl_2$, $MgCl_2$ *v.* NaCl, KCl *v.* NaCl, KCl *v.* $MgCl_2$, and $CaCl_2$ *v.* NaCl. Expressed in terms of valency of ions, it was found that divalent ions may antagonize monovalent and divalent ions, and that monovalent ions may antagonize divalent ions and to a slight extent monovalent ions. In general the antagonistic effect on yeast was found to be similar to the recorded work on bacteria, plants, and animals.

The experimental data are given in tabular and graphical form and a bibliography of 38 references to the literature cited is appended.

A study of the water-soluble accessory growth-promoting substance in yeast, I, J. C. DRUMMOND (*Biochem. Jour., 11* (*1917*), *Nos. 3–4, pp. 255–272, figs. 15*).—The literature on the properties of the "antineuritic vitamin" and the growth-promoting food accessory "water-soluble B" is reviewed, and investigations aiming at the isolation and identification of the latter substance are described. Experimental evidence is given demonstrating that certain of the properties possessed by both are very similar, thus supporting the view of McCollum and others that the two substances are identical. Attempts at isolating the water-soluble accessory in yeast were unsuccessful, but the failure was attributed by the author more to the adsorption of substances of this class from solution by precipitates than to their reputed instability.

Contributions to the biochemistry of pathogenic anaerobes.—II, The acid production of Bacillus welchii (B. perfringens) and B. sporogenes (Metchniffok), C. G. L. WOLF and S. V. TELFER (*Biochem. Jour., 11* (*1917*), *No. 3–4, pp. 197–212, figs. 2*).—This continues work previously noted (E. S. R., 38, p. 483).

In order to investigate the acid production of fermentations of *B. welchii* and *B. sporogenes*, a critical study was made of Dyer's method of separation of volatile fatty acids in a mixture (E. S. R., 37, p. 13). The method, while satisfactory in dealing with a mixture of two volatile acids, was unsatisfactory with a mixture of unknown acids, and the following modification was used in the present investigation:

A portion of the fermented liquid was distilled exhaustively to determine the total amount of volatile acids present and another portion distilled as a simple acid mixture according to Dyer's method. This indicated the highest and lowest acids in the mixture. Fractionated portions of a series of separate steam distillations were then collected, the total amount of acid in the fractions calculated from the distilling rate of the mixture, and chemical tests applied to the concentrated distillates of the fractions. Finally, an artificial mixture of acids was prepared from a study of the data so obtained and its rate of distillation compared with that of the fermentation liquid. The authors state that the method is tedious in application and affords only approximate results, but is useful in giving important information regarding the acids produced by various organisms.

The results with *B. welchii* and *B. sporogenes* show that large quantities of volatile acids are produced, of which butyric acid is a constant component. In the action of *B. sporogenes* on milk, caproic and valeric acids are formed. Propionic acid was not detected, but its presence is not excluded. Formic acid is not present. Forty per cent of the total acid produced is nonvolatile. The nature of these acids has not yet been ascertained.

Contributions to the biochemistry of pathogenic anaerobes.—III, The effect of acids on the growth of Bacillus welchii (B. perfringens) and B. sporogenes (Metchnikoff), C. G. L. Wolf and J. E. G. Harris (*Biochem. Jour., 11 (1917), No. 3–4, pp. 213–245, figs. 8*).—Investigations on the effect of acids on the growth of *B. perfringens* and *B. sporogenes* are reported, together with the results of an examination of the behavior of the acids used with nutrient media.

The addition of acids to liquids containing large amounts of buffer substances produces a complex effect on the true reaction of the media due partly to the type of acid and partly to the nature and content of the buffer substances in the mixture. With the less highly dissociated acids a point is soon reached where successive amounts of the acid affect the reaction but slightly.

The action of acids on the growth of the bacteria studied affects (1) the latent period of growth (the more highly acid the medium the greater time elapses before signs of growth are observed); (2) the final reaction at which growth ceases (with a given acid and varying initial concentrations, a series of reactions is obtained which can be represented by a curve which is individual for each acid); and (3) the total inhibition of growth (the fermentation of both organisms is inhibited by a rise of hydrogen ion concentration which may merely delay growth or may stop it entirely). The inhibiting effect of all acids is the same.

The authors conclude that the results of these investigations confirm their earlier views (E. S. R., 38, p. 483) that the treatment of gas gangrene infections by means of acid solutions, highly buffered, is worthy of trial.

Further observations on the influence of phenol and of cresylic acid on the concentration of antitoxic sera by the Banzhaf (1913) process, Annie Homer (*Biochem. Jour., 11 (1917), No. 3–4, pp. 277–282*).—The author reports that the difficulties in the technique of the Banzhaf process for the concentration of antitoxic sera and the tendency of the end-products to become cloudy may be obviated by the addition of 2 per cent of sodium chlorid and from

0.3 to 0.35 per cent of cresylic acid to the plasma previous to the heating of the plasma-ammonium-sulphate mixtures. The mixtures should be neither heated beyond 60° C. nor allowed to remain at this temperature for more than two or three minutes. Experimental data are given to show that the addition of cresylic acid increases the concentration of the sera and the percentage removal of the serum proteins.

See also previous notes (E. S. R., 37, pp. 376, 877).

A note on the use of indicators for the colorimetric determination of the hydrogen ion concentration of sera, Annie Homer (*Biochem. Jour., 11 (1917), No. 3–4, pp. 283–291*).—Results of investigations on the accuracy of the determination of the hydrogen ion concentration of sera by the colorimetric method of Clark and Lubs (E. S. R., 37, p. 506) with the use of certain indicators are reported.

The author suggests that "in view of the personal error involved in the determination of color reactions with sera it is advisable that each worker using the colorimetric method should ascertain the degree of approximation of his own values to the true values determined by the electrical method."

The preparation of plant nucleic acids, G. Clarke and S. B. Schryver (*Biochem. Jour., 11 (1917), No. 3–4, pp. 319–324*).—Methods are reported for the preparation of protein-free nucleic acid from plant tissues without peptic digestion by first boiling the material used with alcohol and then extracting with warm 10 per cent sodium chlorid solution. The nucleic acid is precipitated from the extract on the addition of hydrochloric acid.

Starch-containing material, such as wheat embryos obtained in the modern milling processes, should be fermented with diastase before extracting with sodium chlorid solution to avoid difficulties in filtering. Analyses are included of nucleic acid obtained by this method from yeast and from wheat embryos. The results agree closely with the formula $C_{38}H_{50}O_{29}N_{15}P_4$ suggested by Levene for plant nucleic acid (E. S. R., 22, p. 115).

The proteins of cow's milk, T. B. Osborne, A. J. Wakeman, et al. (*Jour. Biol. Chem., 33 (1918), No. 1, pp. 7–17*).—A study of the proteins remaining in milk after the removal of casein is reported. The methods of separation and purification of the constituents are given in detail. Analyses of the purified lactalbumin and lactoglobulin gave the following composition:

Composition of purified lactalbumin and lactoglobulin.

Kind of protein.	Moisture.	Ash.	Ash and moisture free.				
			Carbon.	Hydrogen.	Nitrogen.	Sulphur.	Phosphorus.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Lactalbumin	6.25	0.16	52.51	7.10	15.43	1.92	Trace.
Lactoglobulin	8.55	2.12	51.88	6.96	15.44	.86	0.24

Special investigation of the phosphorus in the lactoglobulin showed its similarity to that of the vitellin of hens' eggs and suggested to the authors that lactoglobulin is a similar lecithalbumin or mixture of proteins. That only a trace of phosphorus was found in lactalbumin would indicate that the phosphatids previously obtained from the coagulated protein of milk (E. S. R., 33, p. 660) are not associated with the purified lactalbumin but with the globulin.

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Experiments to determine whether or not proteoses are original constituents of milk were unsuccessful. Examination of Siegfried's "nucleon"[1] showed that it is probably a mixture of uncoagulable protein and some still unidentified organic substances yielding phosphoric acid on hydrolysis. From the alcoholic washings of casein a protein was isolated resembling gliadin of wheat in its solubility in alcohol. An investigation of its physical and chemical properties is to be reported later.

Adenin and guanin in cow's milk, C. Voegtlin and C. P. Sherwin (*Jour. Biol. Chem., 33 (1918), No. 1, pp. 145–149*).—This article reports in detail the methods and data in the determination of adenin and guanin in milk, previously noted (E. S. R., 37, p. 308). The question as to whether the purins of milk are derived from the blood purins or formed from the breaking down of the nucleic acid in the mammary gland is still undecided.

Standard methods of sampling and analysis and standard samples, W. F. Hillebrand (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 8, pp. 68–83*).—Previously noted from another source (E. S. R., 35, p. 415).

A simple, efficient, and economic filter; its application to the filtration of the yellow precipitate in phosphoric acid estimations, S. L. Jodidi and E. H. Kellogg (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 8, pp. 704–708*).—Previously noted from another source (E. S. R., 35, p. 314).

The application of the paper pulp filter to the quantitative estimation of calcium and magnesium, S. L. Jodidi and E. H. Kellogg (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 8, pp. 843–849*).—Previously noted from another source (E. S. R., 34, p. 712).

A quantitative estimation of acetic, propionic, and butyric acids, R. D. Crowell (*Jour. Amer. Chem. Soc., 40 (1918), No. 2, pp. 453–460*).—The method employed by the author consists in the extraction of butyric acid by means of kerosene from an aqueous solution to which calcium chlorid and a little potassium chlorid have been added as salting agents. Some propionic acid is extracted with the butyric, but can be determined by the method of distillation and neutralization with barium hydroxid. The method is described in detail and data given of the mean error in the method of separation.

Experimental work with the method suggested by Phelps and Palmer (E. S. R., 37, p. 206) proved unsatisfactory.

The identification and estimation of lead in water, I, R. Meldrum (*Chem. News, 117 (1918), No. 3036, pp. 49, 50*).—This is a report of investigations into the sensitiveness and reliability of the hydrogen sulphid and potassium chromate colorimetric methods for the detection and estimation of lead in water.

It is pointed out that with the hydrogen sulphid process different waters with equal lead contents give unequal coloration intensity due to the coloring matter in the water sample and also to its saline constituents and other unknown factors. This error may be overcome by using as a standard, instead of distilled water, a sample of the same water which has been rendered lead free. When distilled water is used for the standard, the lead is likely to be underestimated by at least 25 to 33 per cent. With the same water at variable lead dilutions with slightly excessive ratios of reagents, the resulting coloration for any specific lead dilution is also not constant as regards the hydrogen sulphid process.

The hydrogen sulphid colorimetric process in use by the author is described in detail. Experimental data will be given later.

The manganese content of the ash of certain drugs, L. E. Westman and R. M. Rowat (*Jour. Amer. Chem. Soc., 40 (1918), No. 3, pp. 558–562*).—Data

[1] Hoppe-Seyler's Ztschr. Phys. Chem., 21 (1895–96), No. 5–6, pp. 373–375.

are given of the manganese content of certain laxative drug plants. It has been found that for the family Rhamnaceæ the manganese is extracted by water proportionately to its total amount in the bark.

The inversion and determination of cane sugar, A. R. Rose (*Proc. Soc. Expt. Biol. and Med., 15 (1917), No. 2, pp. 16, 17*).—The use of picric acid in the inversion and determination of cane sugar in solutions and extracts is described as follows:

One cc. of the clear liquid containing the sugars is transferred to each of two graduated test tubes containing 2 cc. saturated solution of picric acid. To one of the tubes is added 1 cc. of 20 per cent sodium carbonate. The two tubes are heated for 10 minutes in a bath of boiling water. The same amount of sodium carbonate is added to the second tube and the heating of both tubes continued for 30 minutes. The tubes are cooled and the contents diluted to a suitable volume and matched against a standard solution in a colorimeter. The difference in the readings of the two tubes represents the invert sugar from the sucrose.

In applying this method to solids, such as mashed fruit pulps, from 1 to 10 gm. are taken and triturated in a mortar with 100 cc. of water and a clear liquid obtained by filtering and centrifuging.

It is suggested that picric acid may also be used as the inverting agent in the determination of cane sugar by polarizing. It has no effect on polarized light and in some cases acts as a clarifier and remover of soluble proteins.

The preservation of plant juices for analysis of sugar content, D. O. Spriestersbach (*Jour. Amer. Chem. Soc., 40 (1918), No. 2, pp. 431–436*).—In the course of sorghum investigations at the Minnesota Experiment Station the author examined the action of different preservatives on plant juices to prevent fermentation and hydrolysis of the sugars and at the same time not to interfere with the proper determination of the composition of the juice. Toluene and mercuric potassium iodid were both tested. The latter apparently possesses the greater preserving power. Both showed the maximum effect in boiled samples which had been rendered slightly alkaline with sodium carbonate. From 0.05 to 0.1 per cent potassium mercuric iodid was used or sufficient toluene to saturate the solution.

Preliminary investigations with mercuric nitrate have indicated that it may be even more effective than mercuric potassium iodid.

Home canning of meats (*Okla. Agr. Col., Ext. Div. Circ. 63 (1917), pp. 8*).—This circular gives a list of materials necessary for the successful home canning of meats and general directions for the preparation of meat and for filling and cookstove driers and portable evaporators is included.

How to dry fruits and vegetables for home consumption, C. D. Matthews (*N. C. Agr. Ext. Serv. Circ. 50 (1917), pp. 14, fig. 1*).—The author has compiled the available information on the different methods of drying fruits and vegetables, varieties of driers, and related topics. Detailed directions for the drying of certain vegetables and fruits are given, and a list of firms making cookstove driers and portable evaporators is included.

Action of manganese sulphate in wine fermentation, J. B. Lara (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 8, pp. 839–843*).—The investigations reported show that the addition of manganese sulphate to grape must causes a greater multiplication of yeast. The optimum proportion to be added is 0.005 gm. of the sulphate per liter. A larger amount causes the consumption of all the fermentable sugar by the yeast, imparting to the wine a less agreeable taste. The wine obtained after the addition of manganese sulphate contains no higher percentage of alcohol but has a more aromatic flavor.

Alcohol from discard molasses in the Philippine Islands, H. C. Brill and L. W. Thurlow (*Philippine Jour. Sci., Sect. A, 12 (1917), No. 6, pp. 267–292*).—Some statistics of the alcohol industry in the Philippine Islands and abroad are given and investigations of methods to improve the process of fermentation of molasses as conducted in the Philippines reported. They include several trial experiments on a large scale with and without temperature control. Methods and analytical data are given in detail.

The authors recommend the sterilization of the molasses solution wherever practical, or at least the use of good water for diluting the molasses to a definite density, about 16.5° Brix. Two gm. of sulphuric acid and at least 0.4 gm. of ammonium sulphate should be added to every liter of ferment. The yeast should be grown from pure stock and used in the proportion of 1 part of fermenting wort to 100 or 150 parts of the ferment. The most efficient process was found to be the Molhant method, as applied by Mirior,[1] of increasing the resistance of yeast to more concentrated solutions of alcohol by beginning with a 10 per cent solution of molasses and gradually increasing the strength. The optimum temperature of reaction was between 28 and 30° C.

A handbook for cane-sugar manufacturers and their chemists, G. L. Spencer (*New York: John Wiley & Sons, Inc., 1917, 6. ed., enl., pp. XV+561, figs. 97*).—This well-known handbook (E. S. R., 35, p. 114) has been enlarged to include a chapter on Evaporation and Juice Heating, by W. H. P. Creighton. This chapter includes a discussion of methods of juice heating, with diagrams of apparatus, and of methods of calculation with data from various types of sugarhouse evaporators.

Modern margarin technology, W. Clayton (*Jour. Soc. Chem. Indus., 36 (1917), No. 23, pp. 1205–1209; Rev. Gén. Sci., 29 (1918), No. 1, pp. 22–27; Sci. Amer. Sup., 85 (1918), No. 2200, pp. 134, 135*).—This article gives a brief history of the margarin industry and a summary of the methods now employed in its manufacture.

Determination of the rubber content of latex in the mixing tank for bringing to a standard dilution, J. C. Hartjens (*Arch. Rubbercult. Nederland. Indië, 1 (1917), No. 5, pp. 367–374; Meded. Proefstat. Malang, No. 20 (1917), pp. 8*).—This article reports the results of experiments to ascertain whether the rubber content of bulked latex about half an hour before all the latex had been received differed markedly from the rubber content after all the latex had been received and bulked. The experiments were conducted on five different estates. Samples were taken out of the mixing tank after one-third, two-thirds, and all of the latex had been received. There appeared to be only a small difference in the rubber content of the bulked latex at the different periods of sampling, and consequently there is thought to be no practical objection to taking the sample for determination of rubber content by coagulation before all the latex has been received.

Safety for the household.—VI, Hazards arising from the use of chemicals (*U. S. Dept. Com., Bur. Standards Circ. 75 (1918), pp. 109–117*).—This discusses, first, the dangers from materials in common use without thought of risk, since they in themselves are harmless, and in some cases necessary for existence. The contamination of the water supply by means of lead or bacteria or the formation of ptomaines in food are examples. It then considers dangers from materials of unknown or not generally known properties and composition in more or less restricted use, such as the use of rodent poisons, disinfecting and fumigating materials, or the careless storage or use of dangerous chemicals, such as caustic soda or corrosive sublimate.

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[1] Bull. Assoc. Chim. Sucr. et Distill., 31 (1914), No. 11, pp. 936–940.

METEOROLOGY.

Some temperature correlations in the United States, T. A. Blair (*U. S. Mo. Weather Rev., 45 (1917), No. 9, pp. 444–450, figs. 8*).—Applying the methods of Craig[1] in a study of temperatures in the United States, the following relationships are developed in this paper:

"There is a well-marked seesaw relation between the temperatures of southern California and of the southeastern United States for certain months of the year; for other months the temperatures vary independently; these changes in relationship are not wholly seasonal but appear to have a wave-like oscillation in value; in consequence, the coefficients expressing the annual temperature correlations have intermediate values; there is a definite daily correlation during the time of greatest monthly correlation."

Weather and the yield of winter wheat (*U. S. Dept. Agr., Nat. Weather and Crop Bul. 32 (1917), p. 3, figs. 2*).—A study of data for rainfall and crop yields in Kansas (24 years), Missouri, and Ohio (54 years) indicated that the yield of winter wheat in those States is not controlled by variations in the rainfall for any month or combination of months of the preceding year. The mean temperature for March, however, "apparently influences the yield of wheat in Ohio to a marked extent," that is, a warm March is generally followed by a good wheat yield. "In a study of the relation of the temperature to the yield of winter wheat in Illinois, however, covering a period of 36 years, the marked relation that was found in Ohio was not evident."

Influence of weather conditions on the amounts of nitrogen acids in the rainfall and atmosphere in Australia, O. Masson (*Rpt. Brit. Assoc. Adv. Sci., 86 (1916), pp. 128, 129; abs. in U. S. Mo. Weather Rev., 45 (1917), No. 10, p. 501*).—The results of examinations of about 1,000 daily samples of rain collected at about 16 stations suitably distributed over the continent of Australia, as compared with the daily weather records and isobaric charts, confirm the conclusions of Anderson already noted from another source (E. S. R., 33, p. 617), to the effect that "for a given type of weather the concentration of oxidized nitrogen in the rainfall varies inversely as the amount of rainfall. The total amount of oxidized nitrogen per unit area found in the rainfall accompanying a storm, depends on the type of weather (Antarctic control, tropical control, divided control), and is practically independent of the amount of rainfall."

The results led to the further conclusions that "Antarctic storms at different stations carry down amounts of oxidized nitrogen which do not differ greatly from the amounts previously found at Canterbury [by Anderson]. Rain falling at northern stations (equatorial stations) during the prevalence of trade winds contains amounts of oxidized nitrogen which are almost equal to the amounts found in the rain accompanying Antarctic depressions (rear isobars) at southern stations. This is shown to be probably due to the anticyclonic origin of winds accompanying both types of rain. Passage over land modifies anticyclonic air only to a slight extent; but if, during the passage, it is subjected to the influences accompanying monsoonal disturbances, comparatively large amounts of oxidized nitrogen are found in the subsequent rainfall. The highest total amounts of oxidized nitrogen are found at southern and inland stations in rain water resulting from monsoonal storms following a 'heat wave.' Rains occurring during 'divided-control' weather contain less oxidized nitrogen than tropical rains, but more than Antarctic rains. The nitrogen-fixing powers of inland monsoonal depressions tend toward the gradual enrichment, in respect of oxidized nitrogen, of the soil in southeastern Australia.

[1] Quart. Jour. Roy. Met. Soc. [London], 41 (1915), pp. 89–98.

"A number of determinations of the volume concentration of nitrogen peroxid in the atmosphere during the prevalence of anticyclonic weather has shown that at Canterbury, Victoria, in the rear circulation of anticyclones the air contains a greater proportion of nitrogen peroxid than the air of the front circulation. On the assumption that the oxidized nitrogen of the rainfall is derived from the atmosphere, the amounts of nitrogen peroxid in the latter were compared with the amounts of oxidized nitrogen found in the rainfall at Canterbury for the corresponding weather types. It is shown that air containing 0.56 volume of nitrogen peroxid per 10^9 volumes in the rear of an anticyclone would require to be washed out to a height of about 4,000 ft. above ground-level in order to give the amount of oxidized nitrogen usually found in the rainfall accompanying this weather condition. Similarly, in the case of the front of an anticyclone, it is shown that the height would require to be about 3,100 ft. The above are in fair agreement with the average altitude of rain clouds (base), which according to leading authorities is about 3,500 ft."

Lunar period in the rates of evaporation and rainfall, J. R. SUTTON (*Abs. in Nature* [*London*], *100* (*1917*), *No. 2504, p. 160; U. S. Mo. Weather Rev., 45* (*1917*), *No. 10, p. 501*).—The paper "directs attention to the possibility of a lunar influence governing the evaporation from a water surface, and a lunar period in the incidence of rainfall. Tables are given showing that as the result of hourly observations of evaporation and rainfall during the 120 lunar months from August, 1899, to April, 1909, rainfall has its maximum frequency about the time of moonrise and its minimum just after moonset; also that the rate of evaporation has a maximum and minimum, respectively, shortly after the moon passes the meridian above and below the horizon."

Forests and rainfall experiments (*U. S. Mo. Weather Rev., 45* (*1917*), *No. 9, p. 453*).—Referring to a review by H. R. Mill of an article by M. Hill (E. S. R., 37, p. 716), attention is called to the fact that one of the methods proposed by Mill for studying the relations between rainfall and forestation has been in use by the U. S. Weather Bureau, cooperating with the Forest Service, since 1910 in two contiguous and practically identical watersheds in the Rio Grande National Forest. These watersheds are "at present under identical forested conditions, and have established therein a large number of thermometer, precipitation, and stream-gauge stations. Careful observations will be carried on in both watersheds for a number of years, and at the conclusion of this first period one of the watersheds will be deforested and the same observations continued for a second period corresponding to the first one."

Monthly Weather Review (*U. S. Mo. Weather Rev., 45* (*1917*), *Nos. 9, pp. 439–479, pls. 8, figs. 9; 10, pp. 480–528, pls. 9, figs. 11*).—In addition to weather forecasts, river and flood observations, and seismological reports for September and October, 1917; lists of additions to the Weather Bureau Library and of recent papers on meteorology and seismology; notes on the weather of the months; solar and sky radiation measurements at Washington, D. C., during September and October, 1917; condensed climatological summaries; and the usual climatological tables and charts, these numbers contain the following articles:

No. 9.—Döppler's Principle for a Windy Atmosphere, by H. Bateman; Propagation to Great Distances of the Sound of Cannonade at the Front, by G. Bigourdan; Acoustic Efficiency of Fog-signal Machinery, by L. V. King; Surface Currents of Jupiter, by S. Bolton; Effect of Terrestrial Relief on Ionic Densities in the Atmosphere, by P. L. Mercanton; Observations of Atmospheric Electricity During the Total Solar Eclipse on October 10, 1912, at Boã Vista, Brazil, by W. Knoche and J. Laub; Release of Radium Emanation from Water

at Different Temperatures, by J. Moran; Absorption Bands of Atmospheric Ozone in the Spectra of Sun and Stars, by A. Fowler and A. J. Strutt; Some Temperature Correlations in the United States (illus.), by T. A. Blair (see p. 509); Rainfall and Gunfire, by A. Angot; Bird Migration in Central Switzerland in Relation to Meteorological Conditions, by K. Bretscher; Some Nuclei of Cloudy Condensation, by J. Aitken; Condensation and Evaporation of Gas Molecules, by I. Langmuir; Computation and Measurement of the Complex Molecules of Some Vapors, According to the New Condensation Theory, by L. Andrén; A New Evaporation Formula, by R. E. Horton; Forests and Rainfall Experiments (see p. 510); Excessive Precipitation in London, England, by H. R. Mill; Greatest 24-hour Rainfall at Washington, D. C.; Revolving Fluid in the Atmosphere, by N. Shaw; Motion of a Particle on the Surface of a Smooth Rotating Globe, by F. J. W. Whipple; Motion of the Air in the Lowest Layers of the Atmosphere, by G. Hellmann; The Relation Between Pressure-gradient, Wind, and Friction in Steady Motion, by F. Åkerblom; The Formation of Anticyclonic Stratus, by C. K. M. Douglas; Windward Islands *v.* Leeward Islands (illus.); and Canadian Astronomical Appointments.

No. 10.—Atmospheric Optical Disturbances, Fall of 1911 to February, 1917, by C. Dorno; Transparency of the Atmosphere for Ultra-violet Radiation, by R. J. Strutt; A. Brester's Theory of the Sun; Lunar Rainbow, by H. A. French; Halos of October 3, 1917, in Texas and Ohio (illus.); Device for Observing Radiants of Auroras; Notes on the Climate of France and Belgium (illus.), by P. C. Day (see below); Fog Along the California Coast (illus.), by A. H. Palmer; Relative Frequency of Fog at United States Lighthouses; Glaze, "Glazed roads," "Ammil"; Great Thunderstorm of August 1, 1917, in Trinity County, Cal.; Heaviest Rainfall in the British Isles; Influence of Weather Conditions on the Amounts of Nitrogen Acids in the Rainfall and Atmosphere in Australia, O. Masson (see p. 509); Lunar Period in the Rates of Evaporation and Rainfall, by J. R. Sutton (see p. 510); John West James, 1838–1917; Tropical Hurricane of September 27–28, 1917, in Southeastern Louisiana (illus), by R. A. Dyke; and Annual Rise of the Columbia River, 1917 (illus.), by E. M. Keyser.

Notes on the climate of France and Belgium, P. C. Day (*U. S. Mo. Weather Rev., 45 (1917), No. 10, pp. 487–496, figs. 7*).—The climatic conditions are quite fully discussed, especially from the standpoint of bodily comfort.

SOILS—FERTILIZERS.

Soil acidity and the hydrolytic ratio in soils, C. H. Spurway (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 12, pp. 659–672*).—This article reports investigations made at the Michigan Experiment Station, the results of which are summarized as follows:

"A definite relationship was found between the ratios of calcium to iron and aluminum soluble in fifth-normal hydrochloric acid and the soil reaction. All the acid soils have ratios $CaO:(Fe_2O_3+Al_2O_3)$ above 1:1.3, and all the alkaline soils have ratios below this figure. It is believed that the reactions of the soils studied depend chiefly upon the hydrolytic ratios existing between hydrolyzing compounds of the alkali earths and iron and aluminum.

"A method for determining the calcium oxid required to neutralize a soil by indirect titration is described in which certain fixed quantities of a standardized calcium hydroxid solution are allowed to react separately with varying amounts of soil. The concentrations of soil and solution giving a neutral reaction are chosen from the series by comparing the electrical resistance of

the several solutions, also by means of phenolphthalein indicator. The greatest electrical resistance and faint color of the indicator is coincident with the concentration giving a neutral reaction.

"The quantities of lime required to neutralize the acid soils may be determined by computing the quantities of calcium oxid necessary to add to the acid-soluble calcium oxid found in the soils to bring the ratios $CaO : Fe_2O_3 + Al_2O_3$ to 1:1.3. The quantity of calcium oxid required by this factor method corresponds closely to the quantities required when determined by means of the indirect titration method, and it appears that the titration method is accurate and convenient."

The literature of the subject is reviewed and a bibliography is given.

Soil solution obtained by action of a hydraulic press, G. Ramann, S. März, and H. Bauer (*Internat. Mitt. Bodenk., 6 (1916), p. 27; Zentbl. Agr. Chem., 46 (1917), p. 6; abs. in Jour. Chem. Soc.* [*London*], *112 (1917), No. 655, I, pp. 311, 312*).—The authors point out that the analysis of drainage waters from soils does not afford an accurate means of determining the composition of the normal soil solution, as drainage only occurs when the soils are supersaturated. For this reason they adopted the method of forcing water out of the soil with a hydraulic press. Samples of 3 kg. of soil were taken from the fields and subjected to a pressure of 300 kg. to the square centimeter, the liquid expressed being then analyzed for calcium, magnesium, sulphates, phosphoric acid, and potassium. The sampling was done on six different occasions over a period lasting from May to October; both surface and subsoil were used.

The calcium content was found to vary considerably in the surface soil, but in the subsoil it seemed fairly constant, except for a rise in midsummer. Potassium, contrary to the generally accepted view, behaved very much like calcium, that is, its content fluctuated according to the general concentration of the soil solution, rising when evaporation took place and being lowered by spells of wet weather. Further, there was evidence of potassium and calcium being transported from the subsoil to the surface during a prolonged period of drought, but no evidence was obtained that adsorption exerted any regulating effect on the concentration of the soil solution. The exchange of bases only occurred when the proportion which the dissolved substances bore to one another was altered.

The authors suggest that the selective action of the plant roots, by throwing the soil solution out of equilibrium, would have a considerable effect in bringing fresh supplies of nutrient substances into solution. They state also that the pressure method of obtaining soil water is only applicable in the case of soils made up of very fine particles or containing a considerable amount of humus.

The classification of soils according to the electrical conductivity of their aqueous extract, B. von Howath (*Internat. Mitt. Bodenk., 6 (1916), No. 4, pp. 230–236; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 2, p. 195*).—Studies on the electrical conductivity of the water extracts of about forty soils including gray and brown forest soils, prairie clay, black and brown steppe soils, salt soil, alluvial, and sandy soils are reported to determine whether electrical conductivity of the water extract of soil can furnish a criterion for soil classification. A great variation in electrical conductivity of the extracts was found and the conductivity of the same soil was changed after cultivation. Since electrical conductivity of the aqueous soil extract represents only the relative content of soluble salts it is considered of no value for soil classification.

Soil survey of Pickens County, Ala., A. M. O'Neal, jr., J. L. Andress, J. M. Moore, and E. H. Stevens (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur.*

Soils, 1916, pp. 41, fig. 1, map 1).—This survey, made in cooperation with the State of Alabama, deals with the soils of an area of 560,000 acres, situated in western Alabama, bordering the State of Mississippi. "The topography is prevailingly very rolling to hilly, with broad, level terraces along the Tombigbee and Sipsey Rivers and a few of the larger creeks and broad, flat first bottoms along all the streams." Drainage is said to be generally well established.

The county lies entirely within the Coastal Plain province, the soils having been derived from unconsolidated deposits of sands, gravels, and clay; from slightly consolidated, calcareous deposits; and from alluvial deposits. Nineteen soil types of 13 series are mapped. Ruston fine sandy loam and Susquehanna fine sandy loam predominate, occupying 36 and 17.4 per cent of the total area of the county, respectively.

Soil survey of Craighead County, Ark., E. B. DEETER and L. V. DAVIS (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 32, pl. 1, fig. 1, map 1*).—This survey deals with the soils of an area of 453,120 acres in northeastern Arkansas. Four-fifths of the county consists of flat to gently undulating stream bottoms and terraces, the remainder being occupied by Crowleys Ridge, the topography of which ranges from gently rolling to very hilly. Drainage in the uplands is good while that of the greater part of the lowlands is generally poor.

The upland soils of the county are derived from loessial material, and the lowland soils from first-bottom and second-bottom alluvial material. The soils range in texture from heavy plastic clay to loamy sand. Thirteen soil types of 9 series are mapped. Calhoun silt loam and Sharkey clay predominate, occupying 33 and 14.1 per cent of the total area, respectively.

Origin and properties of agricultural soils, especially of Java, E. C. J. MOHR (*Teysmannia, 28 (1917), No. 3, pp. 137–151*).—This is a discussion of the factors affecting agricultural soil formation, with particular reference to Java soils.

Description of the coffee soils of Pasoeroean and Kediri, Java, M. W. SENSTIUS (*Meded. Proefstat. Malang, No. 15 (1916), pp. 15*).—The physical, mechanical, and chemical properties of these soils are discussed with analytical data.

Sticky soils (kleefgrond) and red soil (terra rossa) of Limburg [Netherlands], D. J. HISSINK (*Verhandl. Geol. Mijnbouwk. Genoots. Nederland en Kolon., Geol. Ser., 2 (1917), No. 5, pp. 197–221*).—Chemical studies on the origin and formation of a sticky clay soil and of red soil in south Limburg are reported.

It is concluded that both the sticky clay and the red soil of the region are products of the weathering of limestone residue. The difference between the two products appears to be indicated by the solubility of weathered silicates in hydrochloric acid. The red soil consisted of a very basic weathered silicate and was practically laterite.

The results of further studies of the process of laterization are taken to indicate that climate and locality influence the weathering of limestone by carbon dioxid, and that laterization in the Karst region may be attributed to the basic reaction of the soil solution.

Soil survey.—I, Pas Geometriques (*Dept. Agr. Mauritius, Coil Circ. 1 (1916), [English Ed.], pp. 4, pl. 1*).—Physical and chemical analyses of the soils of a strip of land 250 ft. wide extending around the Island of Mauritius are reported.

The soils are mainly calcareous sand, containing from 80 to 89 per cent of calcium carbonate. Sometimes they are mixed with earth, thus reducing the calcium carbonate content to from 21 to 64 per cent. Physically the sandy soils

are very permeable. The nitrogen content varies within wide limits. The phosphoric acid content originates only from the organic matter content, and it is shown that the nitrogen and phosphoric acid increase in the same proportions. The calcareous sands are poor in potash, while the black and gravelly soils contain the most potash.

"The percentage of available elements in these soils is very low. Apart from the alluvial soils of the 'Gorges' of Black River, the rest contains but traces of phosphoric acid. . . . In every place where calcareous sand is in large proportion, only traces of available potash are found. On the other hand, in some black soils and other uncultivated ones comparatively high percentages are met with, and these percentages are well above those of the cultivated soils."

Soil survey.—II, Grand Port (*Dept. Agr. Mauritius, Soil Circ. 2* (*1916*), [*English Ed.*], *pp. 3, pl. 1*).—This survey (Part 1 of Section II) reports physical and chemical analyses of samples of the soils of lands forming a natural valley between the Creole Mountain on the east and the highlands east of Rivière Eau Bleue on the west in the Island of Mauritius.

The nitrogen content is considered normal, but available phosphoric acid is present only in traces. The potash content is low.

Soil flora studies, I–V, H. J. Conn (*Jour. Bact.*, *2* (*1917*), *Nos. 1, pp. 35–45; 2, pp. 137–154*).—The substance of this article has been abstracted from another source (E. S. R., 37, pp. 516, 517).

The recent work at Rothamsted on the partial sterilization of soil, E. J. Russell (*Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr.*, *8* (*1917*), *No. 5, pp. 673–681*).—This is a general review of the work on partial sterilization of soil at the station, most of which has been noted from time to time.

Treatment of peat beds to prevent loss of nitrogen by bacterial action, T. Arnd (*Landw. Jahrb.*, *49* (*1916*), *No. 2, pp. 191–213; abs. in Chem. Zentbl.*, *1916, II, p. 237; Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr.*, *7* (*1916*), *No. 10, pp. 1414, 1415; Chem. Abs.*, *11* (*1917*), *No. 10, p. 1513*).—Experiments conducted at the Bremen station for peat investigations are reported to determine whether denitrification and the decomposition of nitrates in peat beds can be prevented. Two methods were used: "(1) Soil conditions were made such as to encourage nitrification and processes favorable to plant growth; and (2) the reduction of nitrates was inhibited by the use of germicides. By the first method denitrifying organisms alone were affected, while by the second method the destruction of both denitrifiers and nitrate reducers was involved."

The soil used in the first method was from a well-rotted peat bed, crumbly and rich in bacteria and containing fair quantities of ammonia, traces of nitrates, but no nitrites. "The sample was put through the 3-mm. sieve and mixed with pure calcium carbonate at the rate of 0.3 gm. of carbonate to 40 gm. of soil (these proportions having previously been shown to produce maximum nitrogen losses). The soil was watered to bring it up to its original water content and placed in glass vessels in layers 0.8 cm., 3 cm., and 9 cm. thick; 0.5 gm. of dry nitrate was added to each vessel, which was then plugged with cotton wool and incubated for a fortnight at 28° C. . . .

"The results showed conclusively that denitrification varies with the depth of the soil layer in the vessels, i. e., with the amount of oxidation which can take place. . . . The mean total losses of nitrogen for the three layers (9 cm., 3 cm., and 0.8 cm.) were 17.8 mg., 2.1 mg., and 3.8 mg., respectively. Where the soil was very loosely packed no denitrification took place, but in other

cases even thin layers of less than 1 cm. thickness showed losses of nitrogen, and it may be concluded that under field conditions where the soil could never have such a large surface exposed as in these experiments, denitrification could never be completely prevented. In practice, therefore, tillage and drainage of peat soils may be always recommended in order to minimize denitrification, but some losses must always be expected from that cause."

With the second method the same apparatus was employed but the soil layers were uniformly 9 cm. thick. The germicides were mixed with the soil in the dry state or in solution at the rate of from 25 to 200 mg. per 60 to 70 gm. of soil.

"Even with the maximum doses of 0.2 gm. of copper sulphate per 12 gm. of dry soil, losses of nitrogen were not completely avoided. With the small doses denitrification was intensified. This unexpected behavior on the part of copper sulphate was probably due to the fact that the greater part of the salt is precipitated as humates in a peaty soil and thus loses its toxicity. The humates which are hardly ionized actually seemed to have a stimulating effect on the denitrifying bacteria."

Neither magnesium sulphate nor zinc sulphate totally inhibited denitrification. Zinc sulphate diminished the action slightly, but with magnesium sulphate it was nearly always slightly increased.

"In a last series of experiments disinfectants which did not owe their germicidal properties to ions were used, i. e., carbolineum, toluene, and carbon bisulphid. Where carbon bisulphid was used the period of incubation was increased from two to five weeks, during which time the soil was maintained at ordinary room temperature instead of at 28° C. The following results were obtained: Carbolineum increased denitrification; toluene had no stimulating effect in whatever proportion used, but neither did it have an inhibitive effect except in one single instance; carbon bisulphid on the other hand always decreased denitrification even when used in very small doses. It would therefore appear that on peaty land carbon bisulphid may be recommended as the best germicide to employ."

Utilization of the fertilizer constituents contained in cane molasses, W. E. Cross and W. G. Harris (*Rev. Indus. y Agr. Tucumán, 7 (1916), No. 3, pp. 95–103; abs. in Internat. Sugar Jour., 19 (1917), No. 222, pp. 281–283; Jour. Soc. Chem. Indus., 36 (1917), No. 15, pp. 897, 898*).—Studies of the ash of cane molasses and distillery vinasse are reported.

Analyses of the molasses ashes show the potash content to be 45 to 50 per cent. "Therefore, the ash without requiring further treatment could be used or sold as a fertilizer, or sold as crude potassium carbonate for use in the manufacture of glass or soft soap, in dye work, or in washing wool. . . .

"The authors observed that by acidifying partially concentrated vinasse with sulphuric acid a complete concentration can be reached, and a black, dry, nonhygroscopic powder suitable for transportation in bags or barrels be obtained, its composition being as follows: Phosphoric acid, P_2O_5, 0.75 per cent; potash, K_2O, 37.5 per cent; and no nitrogen. There must exist a good market for this product, either as a concentrated potash fertilizer (containing about 60 per cent of potassium sulphate), or as potassium sulphate in crude form, to be used as such, or converted into the pure salt. . . .

"Fractional crystallization, employing the same method used in the case of the molasses ash, was also tried in the case of a solution made from the dry

vinasse, after acidifying with sulphuric acid, the analyses of the three salts resulting being shown in the following table:

Results of fractional crystallization of distillery vinasse solution.

Fraction.	Lime (CaO).	Magnesia (MgO).	Soda (Na_2O).	Potash (K_2O).	Sulphuric acid (SO_3).	Water.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
First	16.1	0.7	2.6	26.3	46.7	0.10
Second	1.1	1.0	2.1	49.4	45.6	.04
Third	....	.6	4.4	42.0	44.7	1.00

Of the three fractions the first is the most impure, as it contains a considerable quantity of calcium sulphate, but by means of repeated recrystallization these salts would be raised in purity according to the demands of the market, though it would be difficult to effect such operations in a sugar factory economically.

"In conclusion, the authors mention another method for the utilization of some of the fertilizing elements of vinasse, namely, that of precipitating the nitrogenous matter with lime. In this process the lime is added to the vinasse in the proportion of 1 or 2 per cent and the precipitate formed is separated by filter presses, a fairly dry and hard mass with 1.9 per cent of nitrogen and 58 per cent of water being thus produced. In their experiments along this line, the lime was added to the vinasse in various proportions at different temperatures, being in some tests boiled and in others left to precipitate without being heated at all." It was found that "the lime served only to extract a small proportion of the nitrogenous substance of the vinasse, so it is concluded that it is not worth while to adopt this method on a large scale with Tucumán molasses."

The rate of ammonia formation from cyanamid, C. Kullgren (*Svensk Kem. Tidskr., 29 (1917), No. 2, pp. 40–44; abs. in Chem. Abs., 11 (1917), No. 15, p. 2253*).—Samples of lime nitrogen containing 16.8 and 18.1 per cent nitrogen were dissolved in water and heated in an autoclave to certain given temperatures from 120 to 180° C. for equal periods of time, after which the ammonia evolution was determined. It was found that at a temperature of 120° in 15 minutes 11.3 per cent of the nitrogen had been converted into ammonia, in 45 minutes 31 per cent; at 160° in 15 minutes 48.5 per cent, in 45 minutes 83.7 per cent; and at 180° in 15 minutes 75.2 per cent. The reaction follows the equation $k=(1/t)\log A/(A-X)$, in which A represents the original nitrogen and X that at the end of the time t. The values for k for each temperature increased about 50 per cent for each 10°, the averages for each set of determinations for 10° intervals beginning with 120° being 0.00362, 0.0046, 0.00687, 0.0111, 0.0177, 0.027, and 0.0403.

Comparison of lime nitrogen with ammonium sulphate, J. M. Geerts (*Arch. Suikerindus. Nederland, Indië, 24 (1916), No. 44, pp. 1718–1780, fig. 1; Meded. Proefstat. Java-Suikerindus., 6 (1916), No. 15, pp. 436–498, fig. 1*).—This is a fourth report (E. S. R., 37, p. 123) of fertilizer experiments on Java sugar cane soils in which tests comparing lime nitrogen with ammonium sulphate were made.

Out of 59 tests it was found that ammonium sulphate gave generally better results than lime nitrogen in both cane and sugar production, and on both light and heavy soils. Lime nitrogen gave better results on light soils than on heavy soils. The use of lime nitrogen previous to planting and as a top-dressing showed that partial use of the fertilizer before planting is preferable to its total

use as a top-dressing. When lime nitrogen was used a week before planting and not too extensively used as a top-dressing for young sugar cane plants, there was apparently no injurious effect.

A partial displacement of ammonium sulphate with lime nitrogen gave better results than a total displacement. In this connection the use of lime nitrogen followed by ammonium sulphate gave the best results. Lime nitrogen showed no influence on ripening.

Comparative tests of sources of nitrogen on Coastal Plains soils, T. E. KEITT (*South Carolina Sta. Bul. 192* (*1917*), *pp. 3–14*).—This is a report of comparative field tests at Summerville, S. C., on reclaimed wet Coastal Plains soil during 1911 to 1915, inclusive, of mixed fertilizers containing sulphate of ammonia, nitrate of soda, cottonseed meal, fish scrap, dried blood, bone meal, or tankage, as nitrogen carriers. The fertilizers were applied at the rate of 600 lbs. per acre. Comparative tests were also made of dried blood, sulphate of ammonia, and nitrate of soda (120, 75, and 100 lbs. per acre, respectively), applied as top-dressings in addition to each mixed-fertilizer treatment. Yields of corn, cotton, oats, and cowpeas for hay are tabulated and discussed for each combination indicated and the results summarized.

Complete fertilizers for corn showed very small increases irrespective of the source of the nitrogen, but organic sources gave slightly better results than inorganic sources. The average yield from the 7 nitrogen carriers was 39 bu. per acre, a gain of only 1.1 bu. over no fertilizer, and 1 bu. less than where no nitrogen was used. This is held to emphasize the inadvisability of applying nitrogen to this type of soil before planting corn. Dried blood as a top-dressing showed an average increase of 5.4 bu., sulphate of ammonia 4.7 bu., and nitrate of soda 3.7 bu. of corn per acre. These average results were lower in each case than where the top-dressings were used alone, as follows: Dried blood alone 1.7 bu. more than where applied in addition to complete fertilizers, sulphate of ammonia alone 5.8 bu. more, and nitrate of soda alone 3.1 bu. more. Nitrogen applied as a top-dressing gave better results in each case where the crop was unfertilized than where it received an application of acid phosphate and potash before planting. These differences were: Dried blood 3.1 bu., sulphate of ammonia 5.5 bu., and nitrate of soda 5 bu. per acre.

Complete fertilizers showed material increases in the yield of cotton in every case, the average yield from the 7 sources of nitrogen being 801 lbs. of seed cotton per acre, a gain of 416 lbs. over no fertilizer, and of 171 lbs. over no nitrogen, but the same amounts of phosphoric acid and potash. As an average for the complete fertilizers, dried blood as a top-dressing showed an additional gain of 419 lbs., sulphate of ammonia 412 lbs., and nitrate of soda 307 lbs. of seed cotton per acre. Dried blood applied to cotton previously fertilized with tankage gave the best results.

Complete fertilizers applied to oats showed widely varying results where top-dressed, but better results than where no top-dressing was used. Sulphate of ammonia in a complete fertilizer gave the best results. The average increase over no fertilizer was 13.7 bu., and the increase over an application of phosphoric acid and potash 1.2 bu. per acre. Top-dressings of dried blood applied at the rate of 120 lbs. per acre showed an average increase of 24.6 bu., sulphate of ammonia at the rate of 75 lbs. per acre 34 bu., and nitrate of soda at the rate of 100 lbs. per acre 20.7 bu. per acre. The highest yield, 98.8 bu., was obtained with a complete fertilizer containing nitrate of soda top-dressed with dried blood.

The best average yield of cowpea hay was obtained where nitrate of soda had been used as a top-dressing.

From these results it is concluded that where a definite rotation is practiced on this type of soil and the land is in a good state of cultivation it does not pay to fertilize corn before planting, but that fertilization may be practicable when the crop is about waist high, using a rapidly available source of nitrogen. The oat crop following the corn should be fertilized with phosphoric acid, and a small amount of nitrate of soda to give it a vigorous start, and top-dressed with either dried blood, sulphate of ammonia, or nitrate of soda during the latter part of February or early in March. Potash is deemed unnecessary. Cotton should be liberally fertilized with a complete fertilizer before planting and top-dressed during its early fruiting stage.

Relation of phosphorus and nitrogen in soil to the composition of wheat, J. W. Ames and G. E. Boltz (*Ohio Sta. Bul. 318* (*1917*), *pp. 91–118*, *figs. 5*).—This bulletin reports in detail the results of studies on the yield, physical properties, protein and phosphorus content, and baking quality of wheat grown in the 5-year rotation experiments at Wooster, in experiments with floats at Strongsville, and on a number of different kinds of soils in other parts of the State. It was found "that the composition of wheat grown on soils which have received the same fertilizer treatment for 20 years is affected by the amounts of phosphorus and nitrogen supplied in fertilizers.

"Fertilizers supplying phosphorus increased the size of the wheat grain. Plumpness of grain is largely dependent upon the amount of available phosphorus in the soil.

"The effect of the addition of phosphorus without nitrogen to a soil which is more responsive to phosphorus than to nitrogen fertilization has been an increase in yield but a depression of the protein content of wheat. Where the fertilizer treatment supplied nitrogen with phosphorus the protein content as well as the yield was increased. Wheat grown on soil where the fertilizer treatment included potassium with nitrogen and phosphorus had a lower protein content and produced a larger yield than when the fertilizer treatment included only phosphorus and nitrogen.

"The highest percentage of protein was found in wheat grown on soil deficient in available phosphorus and well supplied with available nitrogen. Nitrate of soda alone caused the largest increase in protein content of wheat and produced only a slight increase in yield. The proportion of phosphorus to nitrogen supplied by the fertilizer and differences in the availability of the nitrogen have apparently been factors responsible for variations produced in the protein phosphorus content of wheat grown under these conditions. The protein content of wheat grown on soil where nitrogen was supplied by organic carriers, tankage, and dried blood was less than where nitrate of soda was used, the same additions of phosphorus, potassium, and nitrogen being made to the soil in both instances.

"There was a tendency for the protein in the flour to parallel the increased protein content of wheat where the supply of available nitrogen in the soil was increased. Nitrate of soda depressed the phosphorus content of wheat when applied in combination with phosphorus as well as when used alone. Phosphorus furnished by floats has decreased the protein and increased the phosphorus content of wheat on Strongsville soil. This effect was produced in wheat grown on soil which had received applications of acid phosphate as well as in wheat grown on unfertilized soil, and was most pronounced where nitrogen without phosphorus was applied.

"The loaf volume of bread obtained in baking tests of flour produced from these wheats varies as the protein content of the wheat and flour. Different varieties of wheat grown on the same soil exhibit wide variations in the

protein and phosphorus content which do not in all cases have a direct relation to the baking quality of the flour milled from the wheats.

"The same variety of wheat, grown in different localities throughout the State on soils which contain varying amounts of phosphorus and nitrogen, does not show the effect of differences in the total supply of phosphorus and nitrogen that is produced in wheat grown on the same soil where the nitrogen and phosphorus supply has been modified by the fertilizer treatment."

Studies on the solubility of phosphoric acid in mineral, calcareous, and basic phosphates and in phosphatic slag, A. Aita (*Agr. Mod.* [*Milan*], *23* (*1917*), *No. 9, pp. 123, 124*).—Experiments are reported and the conclusions drawn that phosphatic slag contains phosphoric acid in the form of tricalcium phosphate, which is fairly soluble in citric acid. In contrast to the mineral phosphates, this is attributed to the specific action of iron and aluminum ions present in the slag. The difference in the solubility of the different slags is attributed to their varying content in iron and aluminum.

Some factors influencing the solubility of phosphoric oxid in mixed fertilizers containing superphosphates, E. V. Flack (*So. African Jour. Sci., 13* (*1916*), *No. 5, pp. 201–208; Chem. News, 115* (*1917*), *No. 3004, pp. 291–294; abs. in Jour. Soc. Chem. Indus., 36* (*1917*), *No. 15, p. 897*).—Experiments are reported from which the following conclusions are drawn:

"Superphosphate can remain mixed for as long as three weeks with either sulphate of ammonia or sulphate of potash or kainit without an appreciable loss of water-soluble phosphoric oxid, and if mixed with sulphate of ammonia there is a possibility of an actual increase of water-soluble phosphoric oxid in a period of three weeks. If immediate reversion of water-soluble phosphoric oxid is to be avoided, Government guano should on no account be mixed with superphosphate, for in a mixture of equal parts of the two there is, even after three hours, a total loss of nearly 7 per cent of the water-soluble phosphoric oxid. In the case of bone meal there is a loss of 2 per cent of water-soluble phosphoric oxid in three hours, but if left for a period of fourteen days there is considerable loss, amounting to over 14.5 per cent."

The effect at Borbhetta of phosphatic manures on a green crop when applied without other manure (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 4* (*1916*), *pp. 127–129*).—Comparative fertilizer experiments with green crops on acid soil are reported, in which basic slag, superphosphate, steamed bone meal, unsteamed bone meal, and bone dust were used at respective rates of 364, 194, 190, 190, and 200 lbs. per acre.

It was found that, per unit of phosphoric acid applied, basic slag gave markedly superior results, while superphosphate, unsteamed bone meal, and bone dust gave results roughly equal. Steamed bone meal gave the poorest results. The difference in the results obtained with steamed and unsteamed bones is attributed to the greater fineness of the latter. The bone products also gave results in the reverse order of their price. The superphosphate gave results characteristic of the effects of acid manure on acid soil.

The utilization of Thomas-meal phosphoric acid with regard to its citric acid solubility, A. Mitscherlich (*Landw. Jahrb., 49* (*1916*), *pp. 661–684; abs. in Chem. Zentbl., 1916, II, p. 765; Chem. Abs., 11* (*1917*), *No. 15, p. 2253*).—Culture experiments on the value of Thomas meal as a fertilizer showed that the plant yields varied approximately as the citric acid solubility of the Thomas meal. It is concluded that there is no reason why Thomas meal should no longer be sold on the citric acid solubility basis.

Experiments with a new potash-phosphoric acid fertilizer, the double silicates of potassium used in its preparation, and various other comparative

fertilizers, T. Remy (*Landw. Jahrb., 49 (1916), pp. 685–728; abs. in Chem. Zentbl., 1916, II, p. 766; Chem. Abs., 11 (1917), No. 15, p. 2253*).—A description is given of the so-called Rhenania phosphate, which is prepared from dicalcium phosphate and phonolite, the phosphoric acid being rendered available to a considerable extent and the potash made practically as effective as potassium chlorid. "Good Rhenania phosphate must contain 3 to 4 per cent K_2O, 12 to 13 per cent P_2O_5, and at least 90 per cent of fine meal. Furthermore, at least 75 per cent of the P_2O_5 must be citric acid-soluble and at least 50 per cent citrate-soluble. Tables are given showing the solubility in various solvents of the P_2O_5 and K_2O in the raw materials, Rhenania phosphate, and two similar preparations (Wolter phosphate and Gafsa phosphate)."

Schröder's phosphate-potash, its preparation, manner of action, and utilization, M. Popp (*Landw. Jahrb., 49 (1916), pp. 729–795; abs. in Chem. Zentbl., 1916, II, p. 767; Chem. Abs., 11 (1917), No. 15, p. 2253*).—Culture experiments conducted at four experiment stations are reported with so-called Schröder's phosphate-potash fertilizers which are prepared by heating raw phosphate with calcium chlorid and magnesium chlorid. The potash was found to act similarly to that of Stassfurt salts, the phosphate-potash fertilizer having the same effect on cereals as 40 per cent potash salts. The yield of potatoes was decreased, due to the action of the chlorin content. The Schröder fertilizer and Thomas meal gave about equally valuable results.

Potash from tule and the fertilizer value of certain marsh plants, P. L. Hibbard (*California Sta. Bul. 288 (1917), pp. 187–192*).—Limited studies of California marsh vegetation, particularly tule (*Scirpus lacustris*) but including certain sedges and cat-tails, indicate that from 100 to 200 lbs. of potash per acre may be obtained from a heavy growth of tule at an approximate cost of from $5 to $10. The percentage of ash in samples of fresh material analyzed varied from 1.8 to 6.6, averaging a little over 3 per cent, and the potash from 0.05 to 1.23, averaging about 0.67. Analyses of crude ash showed that 45.3 per cent of it was soluble in water, and that it contained from 7 to 15 per cent of potash, mostly chlorid and sulphate. The crude ash is not deemed suited for mixture with other materials to make high-grade fertilizers but is more valuable for the extraction of high-grade potash salts.

Fresh tule was found to contain about 6 lbs. of nitrogen, 2 lbs. of phosphoric acid, and 12 lbs. of potash per ton, the proportion varying considerably with the season, locality, and treatment, and it is regarded as comparable with barnyard manure or Pacific coast kelps for fertilizing purposes. Three successive leachings of one day's duration each extracted 85 per cent of the total potash of the plants, and their harvesting before the leaching action of rains sets in is deemed desirable.

While potash recovery from tule may not be commercially profitable it is thought that it may be of considerable local importance under present market conditions.

The importance of liming, J. Hughes (*Jour. Bath and West and South. Counties Soc., 5. ser., 11 (1916–17), pp. 27–44*).—The use of different forms of lime on English soils is discussed.

The action of precipitated magnesium carbonate on soils, W. P. Kelley (*Jour. Amer. Soc. Agron., 9 (1917), No. 6, pp. 285–297*).—Experiments with two light sandy loam soils, low in organic matter, are reported which showed "that the effects produced by precipitated magnesium carbonate may differ widely from those of magnesium sulphate. The addition of comparatively small amounts of the former retarded the formation of nitrate to a marked degree, while as much as 0.5 per cent of the latter produced no effect. It was also

shown that the addition of other alkaline reacting substances, such as sodium and potassium carbonates and calcium oxid, produced effects similar to magnesium carbonate."

It is concluded that the toxic effects that have frequently been noted in studies with the use of magnesium carbonate have been occasioned by excessive alkalinity. "In view of the fact that the naturally occurring carbonates of magnesium produce widely different effects from the precipitated carbonate, together with the evidence set forth above, it seems reasonable to conclude that this material is unsuited for studies on the lime-magnesia ratio. With its use, effects on the reaction of the soil may so affect physiological processes as to obscure the effects that may be inherent within the ratio of calcium to magnesium itself, and therefore the result obtained may lead to entirely erroneous conclusions."

Artificial fertilizers: Prewar and war cost, W. C. Robertson (*Jour. Dept. Agr. Victoria, 15 (1917), No. 5, pp. 295-302, figs. 2*).—This paper deals with prices of fertilizers during the years 1907 to 1917, showing that the increases in prices over the 10-year period in Australia have been for bone dust 15 per cent, superphosphate 28, dried blood 38, sodium nitrate 36, and ammonium sulphate 56 per cent.

Analyses of commercial fertilizers, P. H. Wessels (*Rhode Island Sta. Insp. Bul., 1917, Oct., pp. 3-19*).—This reports the analyses of commercial fertilizers and fertilizer materials, including lime, plaster, and wood ashes, inspected during 1917. A table of lime equivalents for neutralizing purposes is presented, and the amounts of water-soluble nitrogen and potash determined as well as the usual determinations. The character of the water-insoluble nitrogen has been studied, and the chemical work supplemented by tests of the ability of the nitrogen to supply the needs of growing plants.

Analyses of commercial fertilizers, R. N. Brackett et al. (*South Carolina Sta. Bul. 194 (1917), pp. 3-66*).—This bulletin contains the results of actual and guarantied analyses of 1,585 official samples of commercial fertilizers and fertilizing materials offered for sale in South Carolina during the season of 1916-17.

AGRICULTURAL BOTANY.

Ecological studies in the tension zone between prairie and woodland, J. E. Weaver and A. E. Thiel (*Univ. Nebr., Bot. Survey Nebr., n. ser., No. 1 (1917), pp. 60, pls. 6, figs. 31*).—Investigations near Minneapolis, Minn., and Lincoln, Nebr., are said to show that prairie soils to a depth of 30 cm. (11.8 in.) frequently lack available water during the growing season. This gives a clue to the absence of trees on high prairies. While even a brief period of lack of available water would prove disastrous to tree growth, exceptionally wet years might be so favorable as to permit complete establishment and sufficient root growth for the seedling to draw upon the moisture of the deeper soil. On the other hand the prairie soil might be much drier physiologically than the graphs indicate. The whole question of the root distribution of prairie plants as correlated with the seasonal march of soil water at different depths and extending to the lower limit of the soil occupied by the roots, together with the seasonal activity of the plants, requires further investigation.

The great amount of evaporation in the prairie, together with the low water content of the soil, is deemed sufficient cause for the xerophytic character of the vegetation. It shows also the difficulties met by trees in establishing themselves in grassland and may explain their absence from the prairies.

Plants placed in the damper scrub community transpire much less vigorously than others of the same species placed in the prairie. In general there is a correlation between the evaporating power of the air and the amount of transpiration.

When sufficient light is available, the humidity of the air and soil are the most important factors affecting the establishment of the different plant communities. The progressive increase of the humidity of the habitat causes a corresponding increase of the mesophytism of the plant community.

The evaporation rates and the amount of soil moisture in the various communities of both Minnesota and Nebraska vary in general directly with the order of their occurrence in the succession, the community nearest the climax being the most mesophytic in both respects.

Redwoods, rainfall, and fog, W. S. Cooper (*Plant World, 20 (1917), No. 6, pp. 179–189, figs. 2*).—The studies here noted as carried out during the rainy seasons of 1913–14 and 1914–15 in the Santa Cruz Mountains by means of a simple type of rain gauge, described as making possible the summation of precipitation for long periods, are said to show that the California redwood (*Sequoia sempervirens*) requires a high ratio of water supply to water loss, being unusually sensitive to the danger of rapid transpiration, even when the water supply is ample. During the rainless season the soil becomes dangerously dry, even in the more mesophytic habitats. In regions of deficient rainfall the redwood can exist only near permanent streams. The full development of redwood forest requires not only heavy winter precipitation but abundant and frequent summer fogs.

Incipient drying and temporary and permanent wilting of plants, as related to external and internal conditions, B. E. Livingston (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 176–182*).—Discussing recent and former work regarding circumstances connected with the phenomenon of diminished water content designated as incipient drying, the author states that the rate of absorption of water by plant roots appears to be determined by two conditions, the absorbing power of the roots (internal) and the supplying power of the medium in which they lie (external). The internal condition is at least partially controlled by the degree of incipient drying occurring in the plant, which is in turn partly dependent upon the transpiration rate.

Incipient drying of leaves is due to inadequate water supply to these parts, due to causes either internal or external to the plant. The data reported are considered to show that incipient drying, temporary wilting, and even permanent wilting of most of the leaves may occur without any resistance to water absorption by the roots and even in the presence of a relatively low atmometric index. In some cases noted, at least, the inadequacy of absorbing power appears to be due to conditions internal to the plant. None of the three stages of incipient drying is necessarily related to soil-moisture conditions.

The vapor tension deficit as an index of the moisture condition of the air, B. E. Livingston (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 170–175*).—This is an analysis of the index of the air conditions which influence water loss from aerially exposed organisms into its two components, namely, velocity of the air movement or circulation and the moisture condition of the air. It is considered important to give serious attention to the latter, which is defined as that factor in atmospheric evaporating power that is independent of the rate of air movement. The difference between the tendency for water to evaporate into air in contact with its surface (vaporization pressure) and to deposit liquid on the evaporating surface (condensation pressure) is the vapor pressure deficit, and is the factor of atmospheric evaporating power that is not

determined by air circulation. The term relative humidity is rejected, as its use is criticized.

The index of atmospheric evaporating power should equal the product of the index of circulation by the index of the moisture condition, all measurements having been properly weighted and brought into correspondence in deriving the indices. "When it is not desirable or expedient to employ the index of atmospheric evaporating power itself (as determined directly by some form of atmometer), the moisture condition of the air should be stated in terms of the vapor pressure deficit, which demands no correction for air temperature and may represent evaporating power in all comparisons where the index of effective air circulation may be considered as constant."

Atmometric units, B. E. Livingston (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 160–170*).—Summarizing a discussion of atmometers and their employment, the author states that every atmometric measurement should be so formulated as to include all of the features, location, period of operation, units of water lost per unit of time, and type of atmometer. If any of these features is lacking, the expression for the atmometric reading has no intelligible meaning.

A simplified apparatus for measuring the conductivity of electrolytes, R. P. Hibbard (*Rpt. Mich. Acad. Sci., 18 (1916), p. 49*).—This is a brief exposition of the work previously noted (E. S. R., 34, p. 732), and of the features characterizing the modifications in apparatus and technique employed.

A simplification of the present freezing point method for the determination of the osmotic pressure of plant sap, O. E. Harrington and R. P. Hibbard (*Rpt. Mich. Acad. Sci., 18 (1916), pp. 47, 48*).—The work here briefly noted and reported on previously (E. S. R., 36, p. 823) was done upon fleshy tissues. Further work is considered necessary to test the applicability of the method to drier tissues.

Selective permeability and the plasma membrane, J. Davidson (*Plant World, 19 (1916), No. 11, pp. 331–349*).—From the opinions and evidence here discussed the author concludes that the data available regarding the existence of special plasma membranes in plants are too indefinite and indirect to warrant any conclusions at the present time, so that the term plasma membrane as now used may refer to the entire cytoplasm as well as to a special membrane.

There is no adequate method of testing the permeability of living cells. The accepted explanation of plasmolytic phenomena, it is thought, may be incorrect notwithstanding its plausibility.

The influence of an incomplete culture solution on photosynthesis, O. M. Gruzit and R. P. Hibbard (*Rpt. Mich. Acad. Sci., 18 (1916), pp. 50–52*).—The studies here briefly noted, which were intended to determine what influence is exerted upon so-called vital activities of plants (especially photosynthesis) by an incomplete culture solution, were carried out in the greenhouse during the month of February.

The results, which are tabulated, are considered to show that the dry weight per unit area of leaf surface of seedlings is less for those grown in a complete solution than for those grown in a solution which lacks one component. The assumption that a large amount of photosynthate in leaves indicates energetic growth is not borne out. Solutions which lack potassium, calcium, and phosphorus show relatively great gains in weight, but this is not considered as indicating metabolic efficiency in plants grown in solutions lacking these elements. It is suggested that the explanation lies in a reduced translocation and a retarded photosynthesis. Tests with cucumber seedlings in the various solutions show that the increase in dry weight of detached leaves exceeds considerably that of attached leaves. The greatest gain occurred in the complete solu-

tion. Further support was afforded to the hypothesis that the absence of a component retards translocation of the photosynthate, also to the theory that the rate of photosynthesis is retarded when an essential element is lacking.

While further work is considered necessary, it appears from the data already obtained that photosynthesis is greatly modified by the absence of a given component in the nutritive solution, the modification being expressed in the retardation of translocation and the reduced power of photosynthesis.

Studies in the physiology of the fungi.—V, The growth of certain fungi in plant decoctions, B. M. DUGGAR, J. W. SEVERY, and H. SCHMITZ (*Ann. Missouri Bot. Gard., 4 (1917), No. 3, pp. 279–288, figs. 5*).—A continuation is reported of the work previously noted (E. S. R., 37, p. 728), the same methods being employed. Only two fungi were used, *Aspergillus niger* being taken as a representative of saprophytic and *Glœosporium* (*Glomerella*) *gossypii* of parasitic fungi. Besides the decoctions previously used, namely, bean, sugar beet, prune, potato, turnip, and corn meal, decoctions of apple, mangold (mangel-wurzel), celery, carrot, and salmon were employed. The results, as regards growth of these fungi, are exhibited in both tabular and graphical form.

The influence of different values of the hydrogen ion concentration (P_H) in different decoctions is indicated. As in the earlier experiments, the values of P_H in solutions in which Aspergillus has grown are shifted toward the acid side, those in which Glœosporium has grown in the opposite direction.

The formation of structures resembling organic growths by means of electrolytic local action in metals, and the general physiological significance and control of this type of action, R. S. LILLIE (*Biol. Bul., 33 (1917), No. 3, pp. 135–186, fig. 1*).—The data herein presented and discussed raise the question whether in organic growth the essential structural condition is not the presence of semipermeable and hence electrically polarized partitions separating the living substance from its medium, and at which processes of electrolysis may take place. If this is so, it is thought that the prevalence of the cellular type of organization would be largely accounted for.

The similarity between the phenomena described in this paper and many of the most characteristic peculiarities of the organic growth process are considered as too detailed not to signify an identity in some essential underlying condition.

A comparison of mitochondria in plant and animal cells, N. H. COWDRY (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 33 (1917), No. 3, pp. 196–228, figs. 26*).—The author, having worked on the problem of the relationship of plant and animal mitochondria as deduced from observations on these elements in radicles of the pea and in the acinus cells of the pancreas of the mouse, states that the degree of similarity in animal and plant life is very remarkable. Their reactions to fixatives, stains, and supravital dyes are almost identical, their distribution almost universal, and their morphology identical in plants and animals. It is thought that their chemical composition may be the same in both cases, although direct chemical analysis is obviously impracticable. Although their physiology is obscure, their wide occurrence in protoplasm may mean, it is thought, that in addition to certain specific functions, such as the production of chlorophyll, they all have a common duty or part in some such fundamental vital activity as protoplasmic respiration.

[Galactosidase β in the vegetable kingdom], MOUGNE (*Jour. Pharm. et Chim., 7. ser., 15 (1917), No. 11, pp. 339–345*).—The author tested a number of stone or seed fruits (plum, peach, apricot, cherry, apple, cherry laurel), crucifers (*Cochlearia armoracia*, *Sinapis alba*, and *S. nigra*), *Aucuba japonica*, and the fungus *Aspergillus niger*. Nearly all of these gave a decided reaction

showing the presence of glactosidase β, which is thought to exist in all plants containing lactase.

The cause of growth in the hypocotyls of oat seedlings, Marie S. de Vries (*Rec. Trav. Bot. Néerland., 14 (1917), No. 2, pp. 109–118*).—The author concludes that hypocotyl development in *Avena sativa* occurs as the result of evolution of carbon dioxid.

The department of plant physiology, B. E. Livingston (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 133–159, figs. 2*).—This paper, which deals with the general aims of the department and the work accomplished therein and which is intended to serve as a preface to the several preliminary reports which follow, includes a bibliography of the work in plant physiology of Johns Hopkins University during the 7½ years previous to this report.

The sexual cycle in plants, E. A. Bessey (*Rpt. Mich. Acad. Sci., 18 (1916), pp. 59–77, figs. 12*).—In an address before the Michigan Academy of Science the author discusses various theories regarding the development and significance of the sexual cycle in plants.

The hormone theory of chromosome action, E. A. Bessey (*Rpt. Mich. Acad. Sci., 18 (1916), pp. 53–58*).—Reviewing the reasons for the belief that the phenomena of heredity may be bound up with chromosomes, and, considering the possible character of their activities and their probable bearing upon the phenomena of heredity, the author subscribes to the belief that the chromosomes may be the bearers of heredity.

Hybrids of Zea tunicata and Z. ramosa, G. N. Collins (*Proc. Nat. Acad. Sci., 3 (1917), No. 5, pp. 345–349*).—This article has been previously noted from another source (E. S. R., 37, p. 536).

A Hausa botanical vocabulary, J. M. Dalziel (*London: T. Fisher Unwin, Ltd., 1916, pp. 119*).—The author has listed the Hausa names of many of the more common plants of Northern Nigeria, giving the scientific name where known, a brief definition of the plant, and in many cases an indication of its native use and of its products.

FIELD CROPS.

The overhead electric discharge and crop production, V. H. Blackman and I. Jörgensen (*Jour. Bd. Agr. [London], 24 (1917), No. 1, pp. 45–49, pls. 2, fig. 1; abs. in Nature [London], 99 (1917), No. 2481, pp. 232, 233*).—In continuation of work previously noted (E. S. R., 37, p. 336), the effect of overhead electric discharge on an oat crop during 1916 is reported. The electrified area was one acre in extent and two plats of one-half acre each were used as controls. The "earthed" screen of wire netting previously employed to insulate the control areas was deemed unnecessary, the wires being kept low. The discharge was applied by means of a series of 21 wires 4.5 yds. apart, running parallel to the short sides of the rectangular area (88 by 55 yds.). The wires were supported at a height of 7 ft. at each end, but sagged at the center to a height of 6 ft. The current applied was practically the same as heretofore, but the intensity of the discharge was much increased by the lowering of the wires, by reducing the distance between wires, and by reducing the thickness of the wire (24 gauge). The discharge was applied for 848 hours, extending over a period of 125 days.

The yield secured from the electrified area amounted to 62.8 bu. of grain and 4,924 lbs. of straw, as compared with a total yield of 42 bu. of grain and 2,619 lbs. of straw from the control areas. The total increased yield was valued at approximately $30.90, while the cost of the current was approximately $2.67.

A marked residual effect of the discharge upon the clover and grass following the oat crop of 1915 was observed and is to receive further study.

Aerial electrical discharge and increased yields (*Compt. Rend. Acad. Agr. France, 3* (*1917*), *No. 37, pp. 1054–1062*).—A brief review and general discussion of the experimental results noted above.

Electro-culture (*Elect. Rev., 81* (*1917*), *No. 2067, pp. 21–23, figs. 3*).—This briefly reviews experimental work in electro-culture as noted above. Electro-culture apparatus suitable for areas of from 10 to 15 acres is described and illustrated.

[Instructions for observations on the vegetative growth of cereals], S. K. Chaianov and M. P. Ustinovskiĭ (*Instruktsiia dlia Vedeniia Vegetatsionnykh Nabliudeniĭ nad Niekotorymi S.—Kh. Rasteniiami na Voronezhskom Opytnom Polie Gubernskago Zemstva. Chast I: Rozh, Pshenitsa, Oves, Proso i Kukuruza. Voronezh: Rosenberg Bros., 1915, pp. VII+37*).—Directions are given for the time and method of making observations on the vegetative growth of cereals in the field and laboratory, and blank forms illustrated for use in recording such observations with rye, wheat, oats, millet, and corn.

Xenia and other influences following fertilization, A. E. Waller (*Ohio Jour. Sci., 17* (*1917*), *No. 8, pp. 273–284*).—The author discusses in some detail the phenomenon of xenia or "hybridization exposed," as he terms it, with special reference to the distinction between the changes occurring in the endosperm through triple fusion, thus directly associated with fertilization, and those changes which follow fertilization but are remote from it. It is pointed out that the xeniophyte, like the sporophyte, is a fusion product, the egg nucleus of the latter fusing with one male nucleus, while in the former the second male nucleus and the definitive nucleus fuse. The definitive nucleus forms upon the fusion of two nuclei from opposite poles of the female gametophyte, the fusion nuclei appearing after three successive divisions of the megaspore nucleus, during which the egg is differentiated.

The author suggests the term "ectogony" as a proper designation of those influences which follow fertilization and are due to the developing zygote. In xenia variation is said to appear as a direct result of the introduction of hereditary factors.

A brief bibliography is appended.

Report of the department of agriculture, Barbados, 1915–16, J. R. Bovell (*Rpt. Dept. Agr. Barbados, 1915–16, pp. 2–29*).—Experimental work with seedling canes noted more fully in a previous report (E. S. R., 35, p. 134), cotton experiments to improve the quality and increase the quantity of lint from varieties of Sea Island cotton grown in Barbados, variety tests with cassava, economic Caladiums, economic Xanthosomas, and yams, and field tests with leguminous crops and fodder grasses have been continued. Tabulated data are given briefly describing the cotton selections and hybrids grown on the experimental plats of the Barbados department of agriculture and on the cooperative plats, and showing the market classification and value of the cotton selections grown on all plats in 1915–16.

[Field crops], J. Mackenna (*Rpt. Prog. Agr. India, 1915–16, pp. 13–31, 39–43, 44, 45*).—A brief outline is submitted of progress in experimental work with wheat, rice, cotton, sugar cane, jute, indigo, tobacco, oil seeds, and fodder crops conducted at various experimental centers in India during 1915–16. The work included field tests of cultural methods and crop improvement through selection and hybridization.

Report of the Bugyi experimental plat for the year 1915–16, E. Thompstone (*Dept. Agr. Burma, Rpt. Bugyi Expt. Plot, 1915–16, pp. 5*).—This reports

the continuation of work previously noted (E. S. R., 36, p. 830) with somewhat similar results.

Report of the Hmawbi Agricultural Station for the year 1915–16, A. McKerral (*Dept. Agr. Burma, Rpt. Hmawbi Agr. Sta., 1915–16, pp. 16*).—Fertilizer tests with sesame, cotton, and peanut cake as a source of nitrogen for rice indicated that all three were applied at a loss. A comparison of phosphatic fertilizers gave yields of 1,544 and 1,510 lbs. of grain per acre with 2-cwt. applications of bone meal and dissolved bone, respectively, as compared with 740 and 730 lbs. from untreated checks. With basic slag the yield was 1,520 lbs. and with the corresponding check 1,632 lbs. Higher increased yields were secured with combinations of ammonium sulphate and bone meal or dissolved bone than with ammonium sulphate and acid phosphate.

Field tests to compare broadcasting with transplanting rice seedlings, employing 8 lbs. of seed in each case, gave yields of 514 and 539 lbs. of grain, respectively, for the same area (0.25 acre), while the total yield of all the transplanted seedlings amounted to 1,331 lbs. from 0.6 acre. In broadcasting the best results were secured from a 50 to 70-lb. rate of seeding.

Selection work with rice and field tests with sugar cane and tobacco are briefly noted.

Report of the Tatkon Agricultural Station for the year 1915–16, A. McKerral (*Dept. Agr. Burma, Rpt. Tatkon Agr. Sta., 1915–16, pp. 8*).—Field tests with cotton, sesame, castor beans, pigeon peas, corn, Madagascar beans, teosinte, and sugar cane are briefly noted.

[Field crops work at the Koilpatti Agricultural Station], H. C. Sampson and R. Thomas (*Dept. Agr. Madras, Rpt. Koilpatti Agr. Sta., 1913–14, pp. 13; 1914–15, pp. 14, pls. 2; 1915–16, pp. 12; 1916–17, pp. 22, pl. 1*).—Continuing work previously noted (E. S. R., 31, p. 733), the results of cultural and manurial tests with cereals, legumes, and cotton are reported for 1913 to 1917, inclusive. The residual value of different manures and fertilizers applied to unirrigated crops grown on black soil is briefly noted.

[Field-crops work at the Manganallur Agricultural Station], H. C. Sampson and R. Thomas (*Dept. Agr. Madras, Rpt. Manganallur Agr. Sta., 1913–14, pp. 10; 1914–15, pp. 8; 1915–16, pp. 19*).—Extensive manurial tests with rice grown on swamp land are reported for 1913 to 1916, inclusive, with a brief account of local agricultural practices.

[Report of field crops work in the Dutch East Indies], J. Van Breda De Haan, J. E. Van Der Stok, and M. Kerbosch (*Jaarb. Dept. Landb., Nijv. en Handel Nederland. Indië, 1915, pp. 83–87, 124–147, 167–172, pls. 3, figs. 2*).—Cultural and plant-selection tests with rice and other important East Indian crops for 1915 are reported, and the Government's bast-fiber enterprise briefly outlined.

Winter grains, T. S. Parsons (*Wyoming Sta. Bul. 116 (1917), pp. 37–52, fig. 1*).—Briefly reviewing cultural and variety tests with winter grains, including wheat, emmer, rye, spelt, barley, and oats, and tests with spring grains sown in the fall for the period of 1911–1916, inclusive, certain conclusions have been reached and suggestions made with regard to winter grain production in Wyoming.

Winter wheat is deemed the only certain winter grain for the State other than rye, although emmer, spelt, and sometimes barley may be relied upon under good conditions. Buffum No. 17 and Turkey Red have proved to be the best winter wheat varieties. It is recommended that winter wheat be sown early (about July 15) on a summer fallow or after a cultivated crop, and that fall irrigation be given before seeding and summer irrigation whenever needed

up to the ripening stage. Spring grains could not be successfully sown in the fall.

Winter rye and winter vetch grown together have resulted in good yields of excellent forage, the rye affording considerable pasturage in the fall if seeded early.

Varieties of wheat and other cereals (*Agr. Gaz. N. S. Wales, 28 (1917), No. 2, pp. 83–90*).—Recommendations are made of wheat, oat, barley, and rye varieties deemed suited to conditions in New South Wales.

Fodder grasses, Java, C. A. Backer (*Teysmannia, 27 (1916), Nos. 4–5, pp. 253–266, pls. 2; 7–8, pp. 430–437, pl. 1; 28 (1917), Nos. 1, pp. 33–46, pls. 2; 2, pp. 71–94, pls. 4*).—These articles are a continuation of previous work (E. S. R., 35, p. 440. Botanical and cultural notes on *Panicum crus-galli*, *P. colonum*, *P. distachyum*, *P. ambiguum*, *P. amplexicaule*, *P. auritum*, *P. interruptum*, and *P. indicum* are given in considerable detail, together with the results of chemical analyses and notes on the yield and feeding value of the grasses. A rather extensive list of economic and botanical literature relating to these plants is given.

The grasses of Ohio, J. H. Schaffner (*Ohio State Univ. Bul., 21 (1917), No. 28, pp. 253–331, figs. 15*).—A botanical key to the native, introduced, or commonly cultivated grasses of Ohio, comprising about 180 species of the Gramineæ.

Studies of leguminous plants, N. Gangulee (*Poona Agr. Col. Mag., 8 (1917), No. 3, pp. 141–156*).—The author presents the results of preliminary studies on some aspects of nitrogen fixation in certain leguminous plants suitable for green manuring in Poona. The experiments were planned to study the following points: At what stage of growth nodule development and, hence, nitrogen fixation begins; the quantity of nitrogen fixed in the whole plant at various stages of growth; the proportion of nitrogen fixed at various stages of growth normally occurring above and below the ground, the latter being only available with ordinary cultivation, for an increase in the permanent fertility of the land; and the influence of available potash, phosphoric acid, and lime on nodule development, and their effect on the quantity of nitrogen fixed in the whole plant at various stages of growth. Considerable tabulated data are presented and discussed and the conclusions arrived at briefly summarized for each crop used in the experiments.

Dolichos lablab began nodule formation about 15 days after germination, chiefly on the primary roots. Nodules formed on the smaller roots except at the extreme ends but gradually disappeared as the plant approached maturity, with only a few large nodules (about the size of a pea) remaining on the larger roots. The nitrogen in the plant gradually increased from 0.21 per cent in the dried seedling to from 3.7 to 3.9 per cent in the dried plant at the flowering stage. The portions above ground contained considerably more nitrogen than the roots at all stages of growth.

Cicer arietinum developed nodules chiefly on the primary roots, although from 15 to 20 days after germination the large nodules shrank and numerous small ones formed on the smaller roots. Nitrogen increased from 0.23 per cent in the dried plant just after germination to 0.55 per cent at the end of the seedling stage. The above-ground portions of the seedlings are reported to have contained from five to six times as much nitrogen as the below-ground portions.

In *Crotalaria juncea* an abundant supply of nodules were found throughout the root system of healthy plants, especially in the presence of an excess of phosphates. The nitrogen increased rapidly during growth, the maximum being reached at time of full flowering and the most rapid increase occurring

between the eleventh and twenty-fifth days of growth. Nitrogen accumulation appeared to be in direct proportion to an excess of phosphoric acid and lime, while excess potash gave distinctly inferior results except in the very early seedling stages.

Nodules first appeared on *Phaseolus mungo radiatus* when the seedlings were about 10 days old. With an excess of potash and lime small nodules formed largely on the primary roots but extended throughout the root system as the plant approached the flowering stage. An excess of lime encouraged nitrogen fixation and nodule development particularly, while similar results were obtained with an excess of phosphoric acid.

Plants producing fibers analogous to that of kapok, F. MICHOTTE (*Compt. Rend. Acad. Agr. France, 3* (*1917*), *No. 17, pp. 489–493*).—The author lists 38 species, under 13 families, the fibers of which are somewhat analogous to that of kapok, indicating the habitat of each and its particular use.

Marine fiber, D. C. WINTERBOTTOM (*So. Aust. Dept. Chem. Bul. 4* (*1917*), *pp. 36, pls. 17, fig. 1*).—Marine fiber, consisting of the fibrous remains of the sea plant *Posidonia australis*, is said to occur in immense deposits in the shallow coastal water of Spencer and St. Vincent Gulfs, Australia. Detailed descriptions are given of the plant and fiber and of the operations of the three commercial firms occupied in raising and cleaning the fiber. The principal uses of the product include the insulation of steam and refrigerating plants, house cooling, and the manufacture of bedding. Fair qualities of paper have been made from the fiber, and its use by the textile trade is being advocated. The cost of production is estimated at approximately $81.57 per ton delivered at a European port. The market value of the fiber is approximately $110 per ton.

The identity of fiber Agaves, L. H. DEWEY (*West Indian Bul. 16* (*1917*), *No. 2, pp. 104–111*).—In a paper presented before the Fiber Congress held at Surabaya in July, 1911, and here published for the first time, the author briefly describes the 16 principal species of Agave producing commercial fibers, together with synonyms and references to other names which are confused with fiber-producing plants.

A key to the Sisalanae in the West Indies, with brief descriptions of *A. fourcroydes* and *A. sisalana*, is reproduced from the work of Trelease, previously noted (E. S. R., 30, p. 526).

Alfalfa management, B. F. SHEEHAN (*Iowa Agr., 18* (*1917*), *No. 3, pp. 114, 115, 129, 130, figs. 2*).—Replies to inquiries made of a large number of Iowa farmers by the Iowa Experiment Station regarding the production of alfalfa have been compiled and analyzed.

Reports from 367 individuals using a nurse crop showed an average yield of 3.9 tons of hay per acre, as compared with 3.6 tons reported by 603 who seeded without a nurse crop. The failures reported amounted to 17.2 per cent without a nurse crop and 23.4 per cent with a nurse crop. Cutting the nurse crop for hay resulted in an average yield of 3.9 tons of alfalfa for 106 farmers, and where the nurse crop was allowed to mature 3.2 tons. Failures were reported by 10.3 per cent of those who cut the nurse crop for hay, while 21.4 per cent reported failures when cutting the nurse crop for grain. An early-maturing variety of oats, such as Kherson, seeded at the rate of 1.5 or 2 bu. per acre, is recommended for use as a nurse crop.

Attempts to thicken the stand by reseeding without plowing up the field were most successful where the seed was drilled in. Cultivation to control crabgrass, foxtail, or bluegrass was followed by average yields of 3.9 tons for 234 individuals who employed disk harrows and 3.8 tons for 44 who used either springtooth or spike-tooth harrows, while 653 farmers giving no cultivation averaged

3.4 tons. The spring-tooth harrow is recommended for Iowa conditions, with cultivation after the removal of the second or third cuttings.

An average yield of 4 tons per acre was reported by 70 farmers using lime, this being 0.6 ton per acre more than the average yield secured by the 1,003 farmers who did not apply lime. With applications of lime before seeding the yields averaged 0.2 ton more than in applications after seeding. The Iowa drift, southern Iowa loess, and the Mississippi loess soils are deemed most likely to be acid.

Manuring the soil before seeding to alfalfa yielded an average of 3.9 tons per acre for 728 farmers, as compared with 3.4 tons for 502 individuals who did not apply manure. Failures were reported by 14 per cent of those applying manure and by 18.1 per cent of those not applying it.

An average yield of 3.9 tons was secured from 147 seedings on tiled land, while 3.6 tons was obtained from 795 seedings on land not tiled. There were 16.3 per cent failures reported on the tiled ground and 18.8 per cent on the untiled. Higher average yields were secured on the tile-drained fields in all soil areas.

Cassava experiments, J. de Verteuil (*Bul. Dept. Agr. Trinidad and Tobago, 16 (1917), No. 1, pp. 18–20*).—Tests with 11 varieties of cassava in 1915 are reported, the Manioc Sellier variety being first with an estimated average yield of 10.16 tons and Mata Lotera last with 2.62 tons. A comparison of plants grown from top, bottom, and middle portions of the sticks resulted in uniformly higher yields with the middle portions of the three varieties used. Flat planting compared with planting in forked holes 2 ft. square and on banks showed no advantage for the last two methods over the former. Cassava planted with pigeon peas and cotton proved a failure both in the yield of cassava and of the other crops.

The influence of soil temperature upon seedling corn, B. D. Halsted and S. A. Waksman (*Soil Sci., 3 (1917), No. 4, pp. 393–398*).—Two comparable lots of corn were subjected to different soil temperatures in a greenhouse, namely, the warmth of the seed bed in midsummer, from July 30 to August 26, and the comparatively cool conditions of the same bed from October 29 to November 29 before the fire was started. The soil temperatures were taken at 6 a. m. and 6 p. m., and showed daily averages of 25.68 and 12.83° C. (78.2 and 55.1° F.) for the summer and autumn series, respectively.

The tests involved the factors of texture and size of grain, obtained by the selection of the crosses that carried both starchy and sugary grains on the same ear. The shelled corn was assorted into starchy and sugary grains, and these in turn were separated into the larger and smaller kernels, all defective kernels being discarded. The following sets of grains were planted in duplicate for each series, all units having 250 kernels: Starchy larger, starchy smaller, sugary larger, and sugary smaller. Tabulated data are presented showing the relationship to texture and size of grain, or to soil temperature and texture and size of grain of the following factors: Weight of seed, viability, mesocotyl length, emergence, length of plant, weight of seedlings, vigor of seedlings, and variability in length of seedlings. The observations are briefly summarized as follows:

The environmental factor of soil temperature is regarded as a controlling one in the growth of seedling corn. Starchy grains of the same ears were 27 per cent larger than sugary grains, 51 per cent more viable, and emerged nearly one day sooner, showing 25 per cent more vigor and 26 per cent less variability. The larger grains of the same ears weighed 29 per cent more than the selected smaller grains, were only 4 per cent more viable, emerged more slowly by 4

hours, showed 7 per cent more vigor, and nearly the same variability as smaller kernels of the same texture.

The tests suggest that in somewhat favorable conditions for seedlings there may be a practical method of eliminating the weaker ones, thus leaving only those that will give better final results than when all plants from a lot of seed are grown under highly stimulating conditions. This results in a method of selection, and an application to crop growing of the general law of the survival of the fittest. Any conditions of the seed bed that tend to show the degree of vigor of the seedlings are deemed essential in the vital test, and there is a possibility that a lack of either heat, moisture, or light, the leading physical environmental factors, may give the desired result. With such small seeds as those of tomato, eggplant, pepper, etc., a lack of high soil fertility may suffice.

Inheritance of a mosaic pericarp pattern color of maize, H. K. HAYES (*Genetics, 2 (1917), No. 3, pp. 261–281, pl. 1, fig. 1*).—The author describes experiments with a mosaic pericarp pattern color of maize to study the behavior of this character in continued selection of plus and minus variates this character having exhibited a high degree of variability. The subspecies *Zea mays indurata*, known as "brindle flint," was used but did not prove to be homozygous for the character from which it takes its name; consequently, attempts were made to produce homozygous races by self-fertilization. From 1909 to 1914, the work was conducted at the Connecticut Experiment Station and since 1915 at the Minnesota Experiment Station.

Selection experiments have isolated the following types which breed comparatively true: (1) Self-red pericarp, (2) pure for variegation but with a range of variability from ears with only a few seeds with deep red stripes to ears in which nearly all seeds are quite heavily covered with red striations, (3) very slight pattern color which under the microscope appears to be due to the presence of a faint color in some of the pericarp cells, and (4) an uncolored pericarp race. Selection within the second type has not succeeded in isolating strains which breed true for the amount of variegation, extreme minus types tending to give progeny containing more ears of the minus type than are obtained from extreme plus types. Heavily striated, self-fertilized ears proved to be heterozygous, giving a progeny which segregates for one factor difference. The very deeply variegated, heterozygous, self-fertilized ears produced progeny having a greater proportion of variegated segregates deeply variegated than was obtained in the progeny of less deeply variegated, self-fertilized, heterozygous ears.

Crosses are reported with the homozygous types noted above and the results obtained may be briefly summarized as follows: A cross between the self-red selection and the homozygous variegated type gave an intermediate F_1 having ears more deeply striated than the homozygous variegated race. The F_2 grown from self-fertilized F_1 ears showed a segregation of self-red, F_1, and homozygous types, as expected, for one unit factor difference. Back crosses of the F_1 with parental strains gave parental and F_1 types in a 1:1 ratio.

A cross between the self-red selection and pattern selection showed a dominance of the self-red type in F_1, and in F_2 a segregation of self-red and pattern types, in a 3:1 ratio.

A cross between the homozygous variegated selection and the pattern selection gave increased variability in F_1, shown by ears of a higher grade in variegation than the parental variegated race and by the production of a considerable proportion of bud sport ears. In the F_2 some self-red ears were obtained. Pattern ears bore the proportion to other grades of 1:2.3.

A cross between the homozygous variegated race and the colorless race gave F_1 ears of the variegated type, with a segregation in F_2. One ear higher in grade than the F_1 and several ears of the pattern type were obtained, together with a number of ears of the two parental types.

The author concludes that the types for pericarp color were self-red, variegated, pattern, and colorless, and that all but the variegated selections were homozygous for these characters. The failure of the variegated selections to be homozygous in respect to the range of variation is explained by an hypothesis of slight germinal variations. From a study of the relation of these various pericarp characters in crosses between the various homozygous types, it is suggested that certain combinations produce germinal instability, and the conclusion is arrived at that the factors for self-red, variegated, pattern, and colorless pericarp form a series of multiple allelomorphs.

The relation of cob to other ear characters in corn, A. E. GRANTHAM (*Jour. Amer. Soc. Agron., 9 (1917), No. 5, pp. 201–217, pl. 1*).—A statistical study of certain correlations existing between the cob and other ear characters is reported, as conducted at the Delaware Experiment Station from 1910 to 1915. The data were obtained from 3,500 ears in investigations made to determine the relation between the physical characters of ears to the vigor and yield of the plant. The conclusions arrived at may be briefly summarized as follows:

The yield of grain per ear is strongly correlated with circumference of cob. Practically no correlation exists between weight of individual kernels and circumference of cob. Depth of kernel and thickness of kernel are correlated to a moderate degree with cobs of small circumference. Yield of grain per ear is correlated to a considerable degree with weight of cob. Weight of kernel is moderately correlated with cobs of low weight. A very low correlation exists between depth of kernel and weight of cob, the heaviest cobs not carrying the deepest kernels. A fair degree of correlation exists between thickness of kernel and cobs of low weight. Yield of grain per ear has a very slight correlation with low density of cob. A moderate degree of correlation exists between weight of kernel and cobs of low density. Depth of kernel is slightly correlated with density of cob. The correlation between thickness of kernel and density of cob is very low and negative. The coefficient of variability is much higher for weight and density of cob and weight of kernel than for the other characters.

Variety tests of corn, R. Y. WINTERS and J. H. HALL, JR. (*Bul. N. C. Dept. Agr., 38 (1917), No. 2, pp. 3–23, figs. 2*).—Tabulated data are presented showing the results of tests with 42 varieties of corn at six experimental centers in North Carolina, giving the yields for 1916 and average yields for 1914, 1915, and 1916, inclusive. Additional data show the relative value for silage of a number of the varieties tested at five centers. The older varieties Marlboro, Biggs Seven-Ear, Weekley Improved, and Cocke Prolific are reported as giving good results, while promising new varieties which have only been tested a few years include Latham Double, First Generation Cross No. 182, and Jarvis Golden Prolific.

Salting soft corn, H. D. HUGHES (*Iowa Sta. Circ. 41 (1917), pp. 7*).—Tests of salting down corn of varying degrees of maturity indicated that the salt was of considerable value in retarding fermentation and the development of molds and in reducing heating in soft corn. In cribbing soft corn from 0.5 to 1 lb. of salt per 100 lbs. of soft corn may be used to advantage, the amount depending somewhat upon the condition of the corn. The necessity of adequate ventilation of corn stored in the crib is indicated.

On the inheritance of the number of teeth in the bracts of Gossypium, S. C. HARLAND (*West Indian Bul., 16 (1917), No. 2, pp. 111–120, figs. 4*).—General notes are given on bract teeth in cotton, and observations of the first genera-

tion of certain crosses between types of cotton differing in the number of bract teeth are reported.

Frequency polygons of such different forms as Sea Island, St. Croix Native, Upland, and Cauto implied differences in gametic composition in respect to the character of bract teeth. The F_1 generation of two crosses, involving types differing in the number of bract teeth, showed complete dominance of the larger number of teeth, while the F_1 generation from a third cross exhibited an intensification of the character, having a larger number of teeth than either parent. Since certain types are known to have bracts entirely free from teeth, it is deemed possible to secure at least six homozygous types differing constantly in the number of teeth, and consequently at least three factors may be concerned in determining the tooth character of a type possessing the highest number.

Inheritance of oil in cotton, E. P. HUMBERT (*Science, n. ser., 45 (1917), No. 1165, p. 411*).—Ether extractions of the seed from seven mother plants are reported, giving the oil percentages. This is followed by an analysis of the seed of their progeny plants for three progeny years, to show the possibility of producing divergent strains or biotypes from a "variety" of cotton, the one having a relatively high oil content and the other a relatively low oil content.

The three "high" parents showed an average of 19.51 per cent oil and their 9 progeny an average of 20.72 per cent. The four "low" parents had an average of 16.89 per cent oil and their 12 progeny an average of 18.2 per cent. The maximum differences between the parent plants and between the progeny plants were 4.06 and 4.94 per cent of oil, respectively. Seasonal variations raising the oil content of all progeny plants are noted.

Cotton varieties in Georgia.—Variation of the oil content of cottonseed and resistance to disease, L. E. RAST (*Bul. Ga. State Col. Agr., No. 121 (1917), pp. 36, figs. 12; abs. in Science, n. ser., 45 (1917), No. 1169, pp. 507, 508*).—A number of variety tests in different parts of the State are reported, with special reference to early maturity and disease resistance. Toole appeared best adapted to conditions in the southern portion of the State, while College No. 1, Trice, Cook, Hooper, Sunbeam, Cleveland Big Boll, Texas Bur, Culpepper, Caldwell, Meadow, Brown No. 2, Williams, and Lankford are deemed best for northern conditions from the standpoint of earliness. In testing varieties for resistance to anthracnose it was observed that the disease affected both small and practically mature plants, although the greatest injury occurred to the bolls just before they opened.

Three years' observations of the oil content of the seed of different varieties has led to the conclusion that marked differences exist between varieties in this respect, these differences remaining fairly constant, and being transmitted from generation to generation. The varieties showing the highest oil content when grown on the college farm for a 3-year period were Rexall, Hite, Willet Perfection, Cook, and Willet Ideal, with 23.3, 22.55, 22.38, 21.94, and 21.78 per cent, respectively. Lankford and Caldwell, with oil contents of 18.88 and 19.93 per cent, respectively, were lowest. Marked variations were also found to exist in the oil content of seed from different plants of the same variety.

History, development, and botanical relationship of Egyptian cottons, G. C. DUDGEON (*Min. Agr. Egypt, Agr. Prod. No. 3a (1916), pp. VIII+77, pls. 12*).—An extended historical and botanical study of Egyptian cottons is presented, with tables showing the areas, yields, and average prices for cotton from 1820 to 1916, and the distribution of varieties from 1905 to 1916 by area and percentage of total area. A bibliography of 71 titles is appended, comprising the literature cited.

Results of fertilizing experiments with cotton at the Clemson College station, T. E. KEITT (*South Carolina Sta. Bul. 191 (1917), pp. 3–11*).—In a con-

tinuation of work previously noted (E. S. R., 21, p. 428), this reports the results of fertilizer tests with cotton grown continuously on a Cecil sandy loam soil in the upper Piedmont section of South Carolina, including tests of individual fertilizer ingredients, mixed fertilizers, lime, and manure. Crop yields for each treatment for each year of the nine years 1906–1915 are tabulated and discussed. Additional tests of various fertilizer formulas for the period of 1912–1915, inclusive, are noted.

It is concluded that heavy fertilization is required to maintain high yields of cotton on this soil and that the average of one-third of a bale per acre had not been maintained on the unfertilized plats during the last years of the experiment. Acid phosphate and manure maintained high yields throughout the test, phosphorus apparently being the principal limiting factor with nitrogen a close second. Potash increased yields sufficiently to pay the cost of the fertilizer at pre-war prices but can not now be used profitably. Manure supplemented with phosphorus resulted in an increased yield of seed cotton of 88 lbs. per ton of manure used.

In comparing the value of applications of two sources of plant food it was noted that with phosphoric acid and nitrogen the yield was 25 lbs. less than with a complete fertilizer, with phosphoric acid and potash 342 lbs. less, and with nitrogen and potash 539 lbs. less. Lime could not be applied profitably.

A fertilizer containing approximately 10 per cent available phosphoric acid, nitrogen equivalent to 3 per cent of ammonia, and no potash is deemed best for cotton on this soil under present conditions.

Whole v. cut potato tubers for planting on irrigated land, I, II, L. C. Aicher and J. S. Welch (*Jour. Amer. Soc. Agron., 9 (1917), No. 5, pp. 217–230, pls. 2*).—Experiments are reported regarding the size of tuber pieces to plant for the most economical production of Irish potatoes under irrigation. The work was conducted in Idaho at the Aberdeen substation from 1913 to 1916, inclusive, where 8-, 4-, and 3-oz. tubers were planted whole, halved, and quartered, and at the Gooding substation from 1914 to 1916, inclusive, using 8- to 10-oz. and 4- to 6-oz. tubers planted whole, halved, and quartered, and 2- to 3-oz. tubers planted whole and halved. Idaho Rural was used at both stations.

The average results obtained at the Aberdeen substation are tabulated below and show that although the total yield from whole tubers was 14.4 per cent more than from cut tubers, the percentage of marketable tubers from cut seed pieces was 18 per cent more than from whole seed pieces.

Results of tests with whole and cut potato tubers at Aberdeen, Idaho, 1913–1916.

Kind of tuber set planted.	Stand.	Stalks per hill.	Yield per acre.		Percentage of marketable tubers.	Number of tubers per bushel.		Weight per tuber.	
			Total.	Marketable.		Marketable.	Culls.	Marketable.	Culls.
	Per ct.		*Bush.*	*Bush.*				*Oz.*	*Oz.*
8-oz. whole	99.91	8.67	392.9	200.6	52.6	209	504	4.6	1.8
8-oz. halved	99.97	4.71	333.5	210.5	65.2	196	439	4.9	2.1
8-oz. quartered	89.28	2.63	314.0	218.2	69.1	152	410	5.7	2.3
4-oz. whole	99.99	5.41	368.7	171.0	46.3	179	463	5.3	2.0
4-oz. halved	99.99	2.98	332.9	220.1	66.1	171	418	5.7	2.2
4-oz. quartered	89.31	1.71	322.7	250.9	77.4	152	414	6.2	2.3
3-oz. whole	100.00	4.82	361.7	201.1	54.2	196	449	4.9	2.1
3-oz. halved	98.87	2.64	355.5	253.8	68.8	162	417	5.9	2.3
3-oz. quartered	82.19	1.72	262.7	201.5	78.0	170	412	5.6	2.2
Whole, average	99.97	6.30	374.4	191.0	51.0	194	472	4.9	1.9
Halved, average	99.61	3.44	340.6	228.1	66.7	176	421	5.5	2.2
Quartered, average	86.92	2.02	299.8	223.5	71.5	158	412	5.8	2.2

The results obtained at Gooding are summarized below and are largely comparable to those secured at Aberdeen.

Results of tests with whole and cut potato tubers at Gooding, Idaho, 1914–1916.

Size and portion of tuber planted.	Number of stalks per hill.	Number of tubers per hill.	Average weight of tubers.	Total weight of tubers per hill.	Total weight of marketable tubers per hill.	Percentage of tubers marketable.
			Oz.	*Lbs.*	*Lbs.*	
8 to 10 oz., whole	8.9	22.7	2.6	3.67	2.28	62.12
8 to 10 oz., halved	5.6	17.2	3.5	3.76	2.90	77.12
8 to 10 oz., quartered	2.9	12.5	4.3	3.36	2.65	78.87
4 to 6 oz., whole	7.4	20.8	2.8	3.56	2.33	65.45
4 to 6 oz., halved	4.0	15.0	3.5	3.33	2.50	75.05
4 to 6 oz., quartered	2.3	12.0	3.8	2.85	2.23	78.25
2 to 3 oz., whole	5.2	16.4	3.2	3.25	2.24	68.09
2 to 3 oz., halved	2.9	12.4	4.0	3.11	2.41	77.49

[Chilled v. unchilled potato seed for fall planting], L. Foot (*Univ. Ark. Col. Agr., Ext. Circ. 38 (1917), pp. 4, fig. 1*).—The results of a field test with chilled and unchilled seed potatoes from the spring planting used for the fall crop immediately following showed an estimated acre yield for the chilled seed of 17.88 bu. as compared with 0.62 bu. per acre from the unchilled seed.

Proceedings of the third annual meeting of the Potato Association of America (*Proc. Potato Assoc. Amer., 3 (1916), pp. 16–83*).—The following papers were read and discussed: Grading Potatoes for Market, by H. R. Talmage; Definitions of Market Types for Seven Leading Varieties of Potatoes, by C. L. Fitch; Modern Methods of Potato Culture Abroad and in this Country, by L. D. Sweet; Origin, Introduction, and Primitive Culture of the Potato, by W. F. Wight; Our Present Knowledge of Potato Diseases: What They Are and How to Control Them, by H. A. Edson; Discussion of Potato Seed Certification, by M. F. Barrus; Potato Utilization Possibilities, by H. C. Gore; A Preliminary Report upon the Making of Potato Silage for Cattle Food, by L. A. Round and H. C. Gore; and The Value of Potatoes in Swine Feeding, by F. G. Ashbrook.

[Potatoes] (*Rpt. Minn. Potato Growers' Assoc., 2 (1917), pp. 16–44*).—The following papers were presented at the second annual meeting of the Minnesota Potato Growers Association: Degeneracy of the Potato, by R. Wellington; The Potato Industry in America, by L. D. Sweet; Potato Standardization and Marketing, by C. T. More; Potato Demonstration Work in Hennepin County, by K. A. Kirkpatrick; Potato Certification, by E. C. Stakman; Selecting Show Potatoes, by A. W. Aamodt; and A New Potato Marketing Plan, by W. A. Morse.

Comparative trials with rye grasses, E. Breakwell (*Agr. Gaz. N. S. Wales, 28 (1917), No. 5, pp. 317, 318*).—Comparative trials with Italian and Westernwolth rye grass at Glen Innes, Yanco, and Grafton Experiment Farms and Hawkesbury Agricultural College are briefly noted. Westernwolth rye grass is considered much superior to Italian rye grass, consistently producing a heavier and more uniform crop, and being especially well adapted to the coast and irrigated areas of New South Wales. Both grasses behave as annuals in this region.

Weight of seeds as related to their number and position in the pod, B. D. Halsted (*Torreya, 17 (1917), No. 6, pp. 101, 102*).—The following data are presented to show the relation of the weight of soy-bean seeds to the number and position of the seeds in the pod for three varieties varying greatly in season of growth and size of seed. A total of 29,100 seeds was examined.

Weight of seeds of soy beans of various types.

Type of pod.	Early Brown.	Wilson.	Ito San.	Average.	Pod average.
	Gm.	*Gm.*	*Gm.*	*Gm.*	*Gm.*
1-seeded	0.210	0.141	0.200	0.184	0.184
2-seeded base	.177	.139	.190	.169	
2-seeded tip	.199	.142	.190	.177	.173
3-seeded base	.188	.124	.167	.160	
3-seeded middle	.209	.140	.187	.179	
3-seeded tip	.201	.132	.187	.173	.171
Averages	.197	.136	.187	.1735	

The author suggests the possibility of obtaining from persons in widely separated regions valuable contributions to a knowledge of the seed weights of wild plants bearing their seeds in pods.

Sudan grass, T. H. Lougher (*Estac. Expt. Agron. Cuba Bol. 30* (*1916*), *pp. 19, pls. 6*).—The introduction of Sudan grass into Cuba is briefly noted and the production of the crop for hay and seed discussed.

Experiments with the sugar beet in South Africa, C. F. Juritz (*So. African Jour. Sci., 13* (*1916*), *No. 4, pp. 167–177*).—Field tests with sugar beets and mangels conducted subsequent to those previously noted (E. S. R., 29, p. 432) are briefly reported. Analyses of sugar beets grown during 1911 and 1912 showed a variation of from 3.04 to 17.46 per cent of sugar, depending upon the maturity of the roots.

Regarding successful mangel production as an index to the possibilities of sugar-beet growing, the author presents analyses of five varieties of mangels grown during 1913 and 1914.

Four varieties of sugar beets were tested by E. T. L. Edmeades during 1915–16 with the average total sugar content varying from 15.89 to 18.43 per cent. An analysis of the external portion of the average beets of each variety to a thickness of approximately 1 in. showed a slightly higher percentage of sugar over the remaining portion of the root. Comparative analyses of roots under the average with those over the average sustained the generally accepted view that small beets contain more sugar than large ones of the same class.

An increase in the sucrose content of sugar beets after their removal from the soil, F. G. Weichmann (*Sugar* [*Chicago*], *19* (*1917*), *No. 6, pp. 220–224*).—While engaged in the study and development of a process for obtaining sugar beet cossettes capable of being stored for a long period without suffering decay or material deterioration, the author found that the processed cossettes contained more sucrose than was evidenced by the analysis of the fresh sugar beets. Experiments are reported in an effort to study this phenomenon and to discover a means for the practical application of the results obtained. A method of analysis of dehydrated cossettes based on the international method of hot-water digestion (E. S. R., 31, p. 315) has been developed by the author and is fully described, and its application to the analysis of fresh sugar beets and dehydrated cossettes is discussed.

It is concluded that the transformation of reserve food products in the cells of the sugar beet shows an enzymatic action, while a close parallelism was observed between the manner of action of enzyms and of inorganic catalysts. In both agents was noted a selective action, the prime importance of temperature conditions, the necessity of optimum moisture conditions, and the reversibility of the reactions. Preliminary experiments indicated that a temperature range of from 40 to 50° C. was more favorable for an increase of sucrose than

higher temperatures. Further investigations are to be made to determine the optimum temperature conditions.

The sugar beet seed industry in France, L. MALPEAUX (*Vie Agr. et Rurale, 7* (*1917*), *No. 19, pp. 332–337*).—The commercial production of sugar beet seed is discussed, and selection based on chemical and genealogical analyses, and selection on the farm outlined.

It is estimated that the cost of production would approximate $77.73 per acre, and that with a yield of 1,780 lbs. per acre the cost of production of the seed would be approximately 4.36 cts. per pound.

Sugar cane experiments, 1914–16, J. DE VERTEUIL (*Bul. Dept. Agr. Trinidad and Tobago, 16* (*1917*), *No. 1, pp. 1–14*).—Extensive cane variety tests are reported for four experimental centers, with tabulated data on acre yields and the percentage and general composition of the juice.

Experiments are reported in which the top, the center, and the bottom portions of the cane were compared to ascertain their relative value for sugar production. Ripe canes of B. 156 were employed and were cut and topped in the usual manner. The upper 10 or 12 in., containing 3 or 4 joints, was cut off, and the remaining portion cut into two equal lengths. The percentage of juice extracted amounted to 54.6 for the tops, 65.2 for the centers, and 67.4 for the bottoms, with sucrose contents of 7.52, 17.93, and 17.76 per cent, respectively.

[Report of sugar cane work in Hawaii], H. P. AGEE, G. F. RENTON, J. T. MOIR, and J. HIND (*Hawaii. Sugar Planters' Sta., Proc., 36* (*1916*), *pp. 13–124, pl. 1, figs. 4*).—The following reports, dealing with field tests with sugar cane, were read and discussed before the thirty-sixth annual meeting of the Hawaiian Sugar Planters' Association: Report of the Director of the Experiment Station, Report of the Committee on Cultivation, Fertilization, and Irrigation on Irrigated Plantations, Report of the Committee on Culivation and Fertilization on Unirrigated Plantations, and the Report of the Committee on Cutting, Loading, and General Transportation.

Cuban varieties of sweet potatoes, J. T. ROIG and G. M. FORTUN (*Estac. Expt. Agron. Cuba Bol. 33* (*1916*), *pp. 76, pls. 32, fig. 1*).—Forty-seven types of sweet potatoes found in Cuba are listed, classified as white, yellow, violet, and red, and briefly described. The cultural practices involved in sweet potato growing are described and the uses of the crop and its importance in Cuban agriculture discussed. Insects and diseases attacking the crop are noted.

The comparative efficiency of indexes of density, and a new coefficient for measuring square-headedness in wheat, S. BOSHNAKIAN (*Jour. Amer. Soc. Agron., 9* (*1917*), *No. 5, pp. 231–247, pl. 1, figs. 5*).—The comparative efficiency of the indexes of density now in use are analyzed and a new coefficient presented as a substitute for the present methods of measuring compactness, which do not show the differences between the three types of compact wheats, namely, the squarehead, *Triticum capitatum*, the club, *T. compactum*, and squarehead-club, *T. compacto-capitatum*. An instrument for determining the density or squarehead coefficient of large numbers of heads, and which simultaneously divides the rachis into three equal parts, registers the length of the rachis, and registers the third of the length of the rachis, is described and illustrated as designed by the author and constructed by the Office of Cereal Investigations of the U. S. Department of Agriculture.

Four of the older formulas are compared, including those of Derlitzki and Neergaard, with reference to their application in measuring different types of wheat heads and to determine the experimental errors involved in their operation. The author concludes that of the formulas given " the average internode

length represents the best method for determining density, as density is dependent directly upon the length of the rachis and the number of its units, the internodes, of which it is composed." As square-headedness results from the shortening of the terminal internodes, it was found that the ratio between the number of internodes in the middle third of the rachis and the number in the upper third would best express the degree of square-headedness. The coefficient of square-headedness is found, therefore, by the formula $Sq=\frac{I_1}{I_2}$, when I_1 is the number of internodes in the terminal third of the rachis and I_2 the number in the middle third.

Influence of environment on the color of the wheat grain, G. L. Kottur (*Poona Agr. Col. Mag., 8 (1917), No. 3, pp. 183–185*).—A study of environmental influences on the color of the grain of white wheats in the Bombay Presidency, India, led the author to conclude that while such influences may result in discoloration of the grain the effect was neither permanent nor progressive.

Wheat and its products, A. Millar (*London and New York: Sir Isaac Pitman & Sons, Ltd., 1916, pp. X+134, pls. 3, figs. 36*).—This contribution to Pitman's Common Commodities of Commerce series, contains a brief account of wheat and its products, with regard to its habitat, transportation, and the modern methods of producing wheat flour.

The moisture content of heating wheat, C. H. Bailey (*Jour. Amer. Soc. Agron., 9 (1917), No. 5, pp. 248–251*).—Moisture and other data are presented which were secured from an examination of heating spring wheat received at Minneapolis and sampled during the 14 days from August 3 to 16, 1916, under unusual temperature conditions. The mean maximum daily temperatures in July and August, 1916, at Minneapolis were 88.3 and 81.7° F., respectively, as compared with 75.5 and 75°, respectively, for the same months in 1915. The determinations were made at the Minnesota Grain Inspection Department Laboratory.

The data indicate that the moisture content of sound, plump, spring wheat must be above the normal (about 13.75 per cent) before heating ensues, even under such extreme temperature conditions as those of 1916. Of two samples of heating wheat examined, containing less than 14 per cent of moisture, one was frosted and the other shriveled. All samples containing less than 14.3 per cent of moisture were shriveled, with low weight per bushel, indicating a tendency of such grain to heat. The author concludes that sound, plump, hard wheat containing less than 14.5 per cent of moisture will keep without heating in storage in a temperate climate, while a lower moisture limit must be employed in storing shriveled and frosted wheat, and possibly with sound, plump wheat in tropical climates.

Yucca, R. S. Cunliffe (*Estac. Expt. Agron. Cuba Bol. 34 (1916), pp. 66, pls. 22, fig. 1*).—Cultural practices employed in yucca growing in Cuba are given in detail, and its uses as human and stock food and for starch production discussed. Brief descriptions are given of 54 varieties, together with their chemical analyses. Insects and diseases attacking the crop are noted.

Montana grain inspection and the Federal grain standards for wheat, A. Atkinson (*Montana Sta. Circ. 68 (1917), pp. 14*).—This circular gives the rules and regulations governing the taking of samples of grain for grading by the Montana grain inspection laboratory and the Federal standards for wheat as announced by the Secretary of Agriculture. That part of the text of the Montana State grain-inspection law applying to the above is included.

[Report of seed testing and experimental work at Oerlikon, Zurich], F. G. Stebler, A. Volkart, and A. Grisch (*Schweiz. Samen Untersuch. u. Versuch-*

sanst. Derlikon-Zurich, Jahresber., 39 (1915–16), pp. 34; Landw. Jahrb. Schweiz, 30 (1916), No. 1, pp. 1–28; 31 (1917), No. 2, pp. 268–301).—The results of seed inspections for 1914–15 and 1915–16 are reported. The average percentage of purity, germinability, and availability is given for samples of seeds of clover, grasses, annual and perennial fodder plants, other legumes, grains, fiber plants, roots, other vegetables, and trees.

General notes are given on cultural experiments in progress at Zurich.

Weed seeds and impurities in imported seed, E. BREAKWELL (*Agr. Gaz. N. S. Wales, 28 (1917), No. 6, pp. 405–408*).—A tabulated list of the weed seeds found in 1,000 official samples of agricultural and vegetable seed imported into New South Wales since July 1, 1916, is presented. The percentage of weeds in the samples varied from a trace to 12 per cent.

Solanum rostratum.—**A new weed plant,** T. G. B. OSBORN (*Jour. Dept. Agr. So. Aust., 20 (1917), No. 10, pp. 783, 784, fig. 1*).—The first occurrence of *S. rostratum* in South Australia is recorded and the plant briefly described.

HORTICULTURE.

Commercial plant propagation, A. C. HOTTES (*New York: A. T. De La Mare Co., Inc., 1918, pp. 180, figs. 106*).—An exposition of the art and science of increasing plants as practiced by the nurseryman, florist, and gardener. The opening chapters deal with propagation by means of seeds, cuttings, bulbs, layers, divisions, and graftage. Directions are then given for propagating stocks for various fruits, certain commercial florist's plants, herbaceous perennials, annuals, bulbous plants, trees, and shrubs. The book concludes with a reference list of books on plant propagation.

Observations on the color of seeds originating from spontaneous crossing between two forms of Phaseolus vulgaris, J. F. LUNDBERG and Å. ÅKERMAN (*Sveriges Utsädesför. Tidskr., 27 (1917), No. 3, pp. 115–121*).—A study of color inheritance in the progeny of crosses between two kinds of brown beans is reported.

The common bean (Phaseolus vulgaris), H. COMES (*Bol. Agr. [Sao Paulo], 18. ser., 1917, Nos. 9, pp. 712–726; 10, pp. 793–807; 11, pp. 928–947*).—An account of the common bean (*P. vulgaris*) with reference to its history, phylogenesis, and supposed toxicity of certain forms.

Observations on the eight-year experimental culture of kitchen vegetables on peat soil rich in nitrogen near Torestorp, H. VON FEILITZEN (*Svensk. Mosskulturför. Tidskr., 31 (1917), No. 4–5, pp. 364–386, figs. 19*).—Experiments were conducted with most of the common vegetables for a number of years. The experiments, as a whole, indicate that good results may be obtained on peat soil if it is well fertilized and properly cultivated. The soil used in the work showed a low content in potash and phosphoric acid.

The principles and practice of pruning, M. G. KAINS (*New York: Orange Judd Co., 1917, pp. XXV+420, figs. 325*).—A treatise on pruning embodying the important results secured in investigations by experiment station workers and others in this country and abroad. The successive chapters discuss plant physiology as related to pruning, the philosophy of pruning, buds, pruning principles, how wounds heal, prevention and repair of mechanical injuries, dressings for wounds, pruning nursery stock, pruning young trees, pruning mature trees, care of top-worked trees, bush fruit pruning, grape pruning and training, pruning ornamental trees and shrubs, dwarf tree pruning and training, odd methods of pruning and training, practical tree surgery, and rejuvenation of neglected trees.

References to the literature of cited investigations are included.

The question of "bulk" pruning, V. R. Gardner (*Fruit World Austral., 19 (1918), No. 1, pp. 2–4, 6, 7*).—In this paper, which was read before the American Pomological Society, the author analyzes the types of pruning generally employed, and presents evidence to show that the radius of influence within the tree of any pruning (i. e., the cutting out or cutting back of any particular shoot or branch) is comparatively narrow. Roughly speaking, the only parts of the tree to show response to pruning are those close to the pruning wound and close to the space left by the removal of a branch. The author concludes in substance that if the pruning that is to be afforded orchard trees is to be such as will help establish and maintain rather than disturb a proper balance between vegetative and fruiting wood, all parts of the tree should be pruned annually and the pruning should be limited to the shoots, spurs, and smaller branches.

Report of the director of fruit culture, A. H. Benson (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1916–17, pp. 64–71, pl. 1*).—A review of the present status of the fruit and vegetable industries in Queensland, including tabular data showing the exports and imports of fruits and vegetables for the year ended June 30, 1917.

Sixteenth report of the Woburn Experimental Fruit Farm, Duke of Bedford and S. U. Pickering (*Woburn Expt. Fruit Farm Rpt., 16 (1917), pp. 76, fig. 1*).—In continuation of previous reports dealing with fruit investigations conducted at the Woburn Experimental Farm (E. S. R., 35, p. 37; 36, p. 140) this report embodies the results of a large mass of observations made of the behavior of apple and other fruit trees, gooseberries, currants, raspberries, and strawberries under different manurial treatment since the farm was established in 1894. Comparative data are also given for potatoes and onions. The results secured are summarized in a series of tables and discussed at length. Data on the work previous to 1904 have been published in a previous report (E. S. R., 16, p. 872).

Summarizing the results of the fertilizer investigations as a whole, it appears that farm crops, such as potatoes and onions, have responded favorably to manurial treatment and there has been very little difference between the results from artificial manure and dung. Apples grown in similar soil have not responded favorably to manurial dressings of any kind. The application of manures to strawberries increased the yield of fruit by only 12 or at most 15 per cent above that from plants receiving no manure at all. On the other hand, the authors conclude that it would be madness to attempt to grow gooseberries or other bush fruits without a liberal supply of dung. Artificial manures have not proved an efficient substitute for dung and under the conditions of the experiment their use in addition to dung has produced no good results.

Report on the statistics of vineyards, orchards, and gardens, and root crops for the season 1916–17, W. L. Johnston (*So. Aust. Statis. Dept. Bul. 3 (1917), pp. 4*).—Statistics on the area, production, and value for the year 1916–17, together with comparative data for the four previous seasons.

Dusting v. spraying, L. Caesar (*Canad. Hort., 41 (1918), No. 2, pp. 21, 22, fig. 1*).—A comparative test of dust and liquid sprays conducted in 1916 and in 1917 in the Niagara district of Ontario indicates that the dust spray gave almost as good results as the liquid spray, both with apple scab and the codling moth. The cost of the two methods for large trees was about the same, but for small trees spraying was much cheaper. Although the author succeeded in controlling the San José scale on 48 large trees with a special dust sold for this purpose, it is believed that to do satisfactory work the dust must be ground much finer or must be applied just after a shower.

The author used dust with very satisfactory results on sweet and sour cherries as a means of preventing rot during the picking season. The dust applied was composed solely of sulphur and ground talc without any poison. The fruit and foliage of these orchards had been kept covered by lime-sulphur and arsenate of lead during the earlier part of the season.

Dusting successfully controlled powdery mildew on red varieties of grapes without burning the foliage.

See also a previous note (E. S. R., 37, p. 832).

Applying sprays for best results, G. E. Sanders (*Canad. Hort., 41 (1918), No. 2, pp. 23, 24, fig. 1*).—An extract from an address on this subject delivered at the annual convention of the Nova Scotia Fruit Growers' Association, and based upon experimental work conducted in Nova Scotia under the direction of the author in 1916 and 1917.

Helpful hints on dusting peaches, W. W. Chase (*Ga. Bd. Ent. Circ. 24 (1918), pp. 7*).—This circular contains directions for the use of dusting machines in applying dust mixtures for the control of brown rot, peach scab, and, to some extent, curculio.

The why of the "June drop" of fruit, A. J. Heinicke (*Cornell Countryman, 15 (1918), No. 5, pp. 267, 268, 292, 294, 296, figs. 3*).—A popular discussion of the factors influencing the set of fruit, with special reference to apples.

California's grape industry, C. J. Wetmore et al. (*Cal. Bd. Vit. Comrs. Bul. 10 (1918), pp. 30*).—A statistical review of the California grape industry for the season of 1917, including data on present viticultural activities and suggestions dealing with the preservation and future development of the grape industry.

Where and how to grow avocados, W. Popenoe and E. Simmonds (*Fla. Grower, 17 (1918), No. 7, pp. 7–10, 16, 17, 23–26, figs. 8*).—This article contains detailed instructions for growing avocados in southern California and southern Florida, together with a descriptive list of varieties.

The native bananas of the Hawaiian Islands, V. MacCaughey (*Plant World, 21 (1918), No. 1, pp. 1–12*).—This paper briefly considers some of the introduced bananas and discusses somewhat in detail the native varieties.

Better California grapefruit, A. D. Shamel (*Cal. Citrogr., 3 (1918), No. 5, pp. 94, 115, 116, figs. 4*).—A progress report on work conducted during 1917 in the improvement of grapefruit by top-working inferior or worthless trees with buds from superior trees. The present work is based upon methods used in bud-selection experiments in California citrus groves (E. S. R., 37, p. 144).

Relation of soil moisture to orange growth, C. A. Jensen (*Cal. Citrogr., 3 (1918), No. 5, pp. 98, 113, fig. 1*).—This paper presents some of the results of soil-moisture experiments with oranges conducted at Riverside and Merryman, Cal., and at Phoenix, Ariz., during the past summer.

The data here presented indicate that there is a close correlation between the growth of orange trees and the amount of available soil moisture present from week to week, an increase in soil moisture producing an almost immediate increase in orange growth. The orange is likewise sensitive to humidity in the air, and in the presence of a relatively high humidity will make considerable growth even when the percentage of available soil moisture is low.

The orange trees obtained no appreciable amount of moisture from soil below 4 ft., thus indicating that it is a waste of water to apply more than is necessary to keep the deeper subsoil up to its moisture-holding capacity. The movement of the soil moisture upward from the deeper subsoil is entirely too slow to supply the roots in the main feeding-soil area with enough moisture to satisfy the normal needs of the tree after the first 3 ft. of soil has been

exhausted of available moisture. The author points out that it requires comparatively little irrigation water to maintain available moisture in the deep subsoil; that an excess of water in the subsoil, when the drainage is poor, is likely to result in root-rot; and that excessive water in a porous subsoil undoubtedly carries down much plant food beyond the reach of the feeding roots.

Papaws, F. Watts (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Montserrat, 1916–17, p. 25*).—A brief account of preliminary work undertaken at the Montserrat experiment station with a view to securing a type of papaw with a high papain content.

Proper place of nut trees in the planting program, C. A. Reed (*Amer. Nut Jour., 8 (1918), Nos. 1, p. 5; 2, pp. 20, 21*).—The author briefly discusses the climatic limitations of cultivated and native nut species in the United States, calls attention to the lack of nut varieties for the section of country east of the Rocky Mountains and north of the pecan belt, and advocates the extensive planting of seedling nut trees along the national highways as a means of furnishing ample material from which to select improved varieties for orchard planting.

Bay trees (Pimenta acris), F. Watts (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Montserrat, 1916–17, pp. 15–18*).—Data are given on cultural experiments with bay trees during the year ended March 31, 1917, with special reference to the yield in leaves and actual amount of oil distilled. Comparative data are given for the years 1912 to 1916, inclusive.

The soil of Netherlands Indies and its use in agriculture (*Verzamel. Verhandel. Grond Nederland. Indië Gebruik Landb., Bodemcong. Djokjokarta, 1916, Nos. 3, pp. 4, pls. 12; 6, pp. 4; 8, pp. 4; 13, pp. 5; 14, pp. 3; 15, pp. 20; 16, pp. 14; 17, pp. 19, pls. 3; 18, pp. 7*).—Among the papers on the above subject presented at the Netherlands Indies Soil Congress, held at Djokjokarta in October, 1916, are the following: The Principles of Cinchona Culture (No. 3), by P. Van Leersum, previously noted from another source (E. S. R., 36, p. 538); Principles of Coconut Culture (No. 6), by P. E. Keuchenius; The Knowledge Relative to the Manuring of Perennial Cultures (No. 8), by A. J. Ultee; A Short Description of the Usual Methods of Preparation for Planting and Subsequent Management of Hevea Trees (No. 13), by C. M. Hamaker; The Principles of Coffee Culture (No. 14), by T. Wurth; Soil in Relation to the Forests (No. 15), by H. Beekman; Coffee Culture in the Residencies of Pasoeroean and Kediri (No. 16), by M. W. Senstius; Green Manuring (No. 17), by C. Bernard, previously noted from another source (E. S. R., 38, p. 20); and Notes on the Tea Soils of Java and Sumatra (No. 18), by J. J. B. Deuss.

Rhododendrons and the various hybrids, J. G. Millais (*London and New York: Longmans, Green & Co., 1917, pp. XI+268, pls. 61*).—A descriptive account of all species of the genus Rhododendron, including azaleas, and the various hybrids. The work is well illustrated with colored and collotype plates, together with numerous illustrations from photographs.

The introductory chapter discusses the love of gardening and gardens, with special reference to rhododendrons. The succeeding chapters deal with the general distribution of the species, Chinese rhododendrons, hybrid rhododendrons, cultivation, rhododendrons for each month of the year, and gardens where rhododendrons are a special feature. The work concludes with an alphabetical list of all known rhododendrons and their hybrids, with descriptions of all those which are generally cultivated and notes on their cultivation, history, and geographical distribution.

An introduction to the study of landscape design, H. V. Hubbard and Theodora Kimball (*New York: The Macmillan Co., 1917, pp. XX+406, pls. 72, figs. 11*).—The purpose of this work is to present a general conception of land-

scape design from the standpoint of designers and also to serve as a general introduction to the subject for those whose interest in it is purely that of appreciation and enjoyment of landscape designs and natural landscapes.

The introductory chapter deals with the scope of landscape architecture and its requirements of the practitioner. The succeeding chapters discuss the theory of landscape design; taste, ideals, style, and character in landscape design; styles of landscape design; landscape characters; landscape effects; landscape composition; natural forms of ground, rock, and water as elements in design; planting design; design of structures in relation to landscape; and types of landscape designs. Appended to the work are notes on the professional practice of landscape architecture in America, notes on procedure in design, and a selected list of references on landscape architecture.

FORESTRY.

Third biennial report of the State forester of Kentucky, 1917, J. E. Barton (*Bien. Rpt. State Forester Ky., 3 (1917), pp. 39, pls. 6*).—A brief review of the activities of the State Board of Forestry along the lines of forestry propaganda, investigation, and protection and of work in the State nurseries and experimental forest, including a financial statement for the fiscal years 1916 and 1917.

Appended to the report are papers on Forest Taxation in the United States, by J. E. Barton (pp. 26–30), and Growing Timber for Mining Purposes, by M. H. Forester (pp. 35–39), together with a check-list of the trees in Kentucky.

Forestry, J. H. Pratt and J. S. Holmes (*N. C. Geol. and Econ. Survey, Bien. Rpt. State Geol., 1915–16, pp. 20–88, fig. 1*).—An account of forest activities in North Carolina during the biennial period 1915–16, dealing with forest protection; the acquisition of State and Federal forest areas; examination of forest lands, farm woodlots, and cut-over lands; reports of meetings of the North Carolina Forestry Association and the Southern Forestry Congress; forestry propaganda; and miscellaneous activities.

Progress report of the Forest Research Institute for the year 1916–17, B. B. Osmaston (*Rpt. Forest Research Inst. [Dehra Dun], 1916–17, pp. 24*).—A report of progress made in investigations dealing with silviculture, development of forest working plans, forest botany, forest economy, forest zoology, and forest chemistry. Appended to the report are a list of forest publications issued since the creation of the Forest Research Institute and a summary of revenues and expenditures for the year.

Proceedings of the National Parks Conference (*U. S. Dept. Int., Proc. Nat. Parks Conf., 4 (1917), pp. 364*).—This comprises a report of various papers, addresses, and discussions of the Fourth National Parks Conference, held in Washington, D. C., January 2 to 6, 1917.

Farm forestry, J. H. Foster, F. H. Millen, and H. B. Krausz (*Texas Agr. Col. Ext. Serv. Bul. B–42 (1917), pp. 17*).—A popular bulletin discussing the importance of farm forests, the principal woods and wood-using industries, and methods of handling and marketing woodlot products.

Plan of cooperation between woodland owners and the State forester (*Md. Bd. Forestry Leaflet 18 [1918], pp. 2*).—The plan provides to give the owners of Maryland woodlands expert advice on their management and on the valuation and sale of woodlot products.

The case for New Brunswick's forests, R. Black (*Canad. Forestry Assoc. [Pamphlet, 1917], pp. 9, pl. 1*).—A brief survey of New Brunswick's forest wealth, together with an appeal for a rational system of forestry and fire protective measures.

British forestry, past and future, W. SOMERVILLE (*London and New York: Humphrey Milford,* [*1917*], *pp. 19*).—In this paper the author discusses various factors tending to make British forestry unprofitable in the past, shows the present need for afforestation, and suggests methods of procedure.

Forestation practice in Norway (*Jour. Forestry, 16* (*1918*), *No. 1, pp. 90–99*).—A summary of forestation practice in Norway based on Lindberg's work on the culture of pine trees in Norway (E. S. R., 33, p. 542).

The trees at Mount Vernon, C. S. SARGENT (*Reprint from Ann. Rpt. Mount Vernon Ladies' Assoc. of the Union, 1917, pp. 16, pl. 1*).—A record, with planting plan, of the size and condition of the trees planted by Washington near his house at Mount Vernon, and of those now standing which have been planted or have sprung up naturally in the neighborhood of the mansion since his death in 1799.

Tree growth in the vicinity of Grinnell, Iowa, H. S. CONARD (*Jour. Forestry, 16* (*1918*), *No. 1, pp. 100–106*).—This paper presents some accurate data on tree growth in Poweshiek, Jasper, and Mahaska Counties, Iowa.

The data show in a general way that the richer upland prairie soils of Iowa are very favorable for tree growth. Growth increment is great enough for the production of timber as a crop on these soils. On the other hand, the capital value has not yet made the timber crop the equal of corn.

Oregon forest facts (*Salem, Oreg.: State Bd. Forestry,* [*1917*], *pp. 8*).—A brief review of Oregon's timber resources and what State and private activity in forest protection has accomplished.

Firewarden's handbook; Oregon forest fire laws (*Salem, Oreg.: State Bd. Forestry, 1916, pp. 48*).—This handbook indicates briefly the forest policy of the State and supplies the information needed by the State firewardens in the discharge of their duties.

Our present knowledge of the forest formations of the Isthmus of Panama, H. PITTIER (*Jour. Forestry, 16* (*1918*), *No. 1, pp. 76–84*).—A paper on this subject read before the Biological Society of Washington, November 18, 1916. It comprises a brief account of some results of the study of the flora of Panama made in connection with a general biological survey organized by the Smithsonian Institution.

Forestry handbook.—II, Some of the principal commercial trees of New South Wales, J. H. MAIDEN (*Sydney: Govt., 1917, pp. 224, pls. 83*).—In continuation of part 1 of this handbook, which discussed forest principles and practice (E. S. R., 35, p. 346), the present part contains descriptive accounts of some of the principal commercial trees of New South Wales. The species are considered with reference to their nomenclature, distinguishing characteristics, character and use of the wood and other products, habitat, and methods of propagation. The descriptions are accompanied by plates illustrating the twigs, fruits, buds, etc., and a reference list of accessible illustrations of trees and shrubs of New South Wales forests is also included.

Probable error in field experimentation with Hevea, O. F. BISHOP, J. GRANTHAM, and M. D. KNAPP (*Arch. Rubbercult. Nederland. Indië, 1* (*1917*), *No. 5, pp. 335–366, fig. 1*).—This has been noted from another source (E. S. R., 37, p. 837).

Results of tapping experiments with Hevea brasiliensis, A. W. K. DE JONG (*Arch. Rubbercult. Nederland. Indië, 1* (*1917*), *No. 5, pp. 378–402*).—A summarized account of the present knowledge on the tapping of Hevea trees.

The suitability of latexometers for determining the rubber content of latex in field tests, A. A. L. RUTGERS and J. G. J. A. MAAS (*Meded. Alg. Proefstat. Alg. Ver. Rubberplanters Oostkust Sumatra, Rubber Ser., No 3–4* (*1917*), *pp. 1–24*).—In view of the contention supported by various writers that

latexometers often give very inaccurate figures as to the rubber content of latex, four series of experiments were conducted under estate conditions in which the percentage of rubber was measured by means of latexometers of different types and also by the dry weight of a slab coagulated from a 50 or 100 cc. sample of latex. The figures found by the latexometer measurements differed from those found by the dry-weight measurements, but the relative figures remained the same.

The authors suggest that the differences may be partly due to errors in the weight of the dry samples. The errors of the latexometer measurements are largely explained by errors in the scale and by the influence of temperature on the readings.

Thirty-seven years of spruce selection in Austria, REUSS (*Centbl. Gesam. Forstw., 42 (1916), No. 11–12, pp. 383–417: abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 8, pp. 1116–1118*).—In continuation of selection studies reported on in 1884 the results are given in this paper of selection studies conducted to 1916. The earlier work is also summarized.

The experiments in pure selection were made with 21 classes of spruce seed taken from parent trees ranging in age from 23 to 142 years. The influence of the parent on the progeny is considered with reference to the climatic origin, age, growth performance, and distinguishing characteristics of the parent. The study is being continued by the Imperial Forestry Experiment Institute at Mariabrunn.

The rotation period of teak, H. BEEKMAN (*Boschbouwk. Tijdschr. Tectona, 10 (1917), No. 12, pp. 995–1044*).—A paper on this subject delivered at the Forest-Keepers' Congress, held at Djocja, October 17–18, 1917.

Forest terminology.—Terms used in the lumber industry (*Jour. Forestry, 16 (1918), No. 1, pp. 1–75*).—This comprises an alphabetical list of terms used in the lumber industry, prepared by a committee of the Society of American Foresters. A similar list of terms used in forestry has been noted (E. S. R., 36, p. 744).

DISEASES OF PLANTS.

The Michigan plant disease survey for 1914, G. H. COONS (*Rpt. Mich. Acad. Sci., 17 (1915), pp. 123–133, pls. 4*).—This is a preliminary account of results obtained in a plant disease survey conducted by the department of botany at the Michigan Agricultural College in cooperation with the U. S. Department of Agriculture.

The present extent of curly dwarf and that of leaf roll of potato is outlined. The cucumber disease situation appears to be serious. A disease of unknown causation, called white pickle, is described supposedly for the first time. A very injurious stunting disease of celery is ascribed to a bacterium which plugs the vascular system. A somewhat similar disease of lettuce is named stunting disease of lettuce. *Sclerotinia libertiana* causes a disease of greenhouse lettuce and a trench rot of celery. Black rot of lettuce is supposedly associated with a Rhizoctonia. Chestnut bark disease has not been found in the State. Maple anthracnose and leaf scorch are contrasted. The Phyllosticta disease of horse chestnut has not proved to be serious. Certain heart rots, especially of maple, though doing serious damage, have largely escaped attention hitherto.

Investigation work [on the control of plant diseases and injurious insects in Ontario] (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 42 (1916), pp. 12–14*).—It is stated that work during this year looking to the control of pear blight was successful, and that a bulletin is to be published on the practical control of that disease.

A somewhat extensive test was made on apples, plums, cherries, peaches, and grapes of a dust mixture composed of 85 per cent very finely ground sulphur and 15 per cent lead arsenate powder, the latter being omitted when not required for insect control. The results have been previously noted (E. S. R., 37, p. 832). In case of apples treatment with calcium arsenate and soluble sulphur resulted in leaf fall and reduction of the size of the fruit.

Peach yellows and little peach have been shown to be spread by budding healthy stock with material from diseased trees. A considerable proportion of the pits from diseased trees (8 per cent) have grown, and none have as yet (after three years) developed the disease.

[Plant diseases in Ontario] (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 42 (1916), pp. 15–18*).—While certain fungus diseases were favored by the cold wet weather during the spring, some others which generally cause serious loss were unusually scarce, owing presumably to the dry weather of the summer months. The most injurious diseases of the year were peach leaf curl (*Exoascus deformans*), apple scab (*Venturia pomi*), leaf spot or shot-hole fungus of cherry (*Cylindrosporium padi*), and raspberry cane blight (*Coniothyrium fuckelii*). Winterkilling was also reported of raspberry and cherry, the latter having been almost completely defoliated by the shot-hole fungus during the previous summer.

Diseases thought to be new to Ontario are rust of cultivated snapdragons and a damping-off disease of young tomato plants, both of which are briefly discussed. The former is said to be due to *Puccinia antirrhini*, the latter to *Phytophthora infestans*.

The results of experimentation during four years indicate that late blight of celery may be prevented by spraying with 4:4:40 Bordeaux mixture when the plants are in the seed bed and at intervals of ten days or two weeks thereafter throughout the growing season. Lime-sulphur is not recommended for celery blight, but the results of one year's test with sulfocide indicate that this substance may prove to be a cheap substitute in this connection for Bordeaux mixture, which is now expensive on account of the high cost of copper sulphate.

Studies have been carried on in the life histories of the fungi causing leaf spot of currants and gooseberries. Overwintered currant leaves bearing *Septoria ribis* have always developed *Mycosphærella grossulariæ*, the ascospores giving rise to a Septoria infecting *Ribes* spp. and presumably being *S. ribis*. Plants have also been infected directly with the ascospores. *R. aurea* is also infected with a species described as *S. aurea*, a perfect stage of which has been found and studied, and for this the name *M. aurea* has been proposed.

A report is made on investigations regarding the cause and control of a disease of winter tomatoes. This does not seem to be carried in the seed, and no organism has been isolated. Steaming the soil is not effective.

Only one white pine infected with blister rust was found.

[Plant diseases in Scotland, 1915], R. P. Wright et al. (*Rpt. Bd. Agr. Scot., 4 (1915), pp. LI, LII*).—The total number of new cases of wart disease of potato reported during 1915 is given as 252. Experimentation has added to the list of known resistant varieties 2 early, 4 second early, and 12 late or main crop varieties. It is thought probable that the power of resistance to this disease may diminish from year to year. The formalin treatment for infected soil, as tested in a garden in which the disease had been present in severe form, proved entirely ineffective.

Inspection control measures regarding American gooseberry mildew having been neglected during the year 1914, the disease reappeared during 1915 in more virulent form and over greater area than formerly. It appears that where

both pruning and spraying or pruning alone had been carefully done the spread of the disease was effectively checked, but where spraying alone had been done, or where one of these treatments had been carelessly done the bushes were in most cases attacked more severely than usual. The disease was reported from new districts, being now present in nearly every county of Scotland.

Plant pathology [India], E. J. Butler (*Ann. Rpt. Bd. Sci. Advice India, 1915–16, pp. 103–113*).—Ufra, due to *Tylenchus angustus*, the most important disease of rice at the present time, continues to extend itself, practically the whole of the districts of Noakhali, Tippera, and Dacca, and parts of Mymensingh and probably Sylhet being affected. The loss is very great, especially in some sections where the main crop is deep water paddy.

The parasite hibernates in the dried stubble, renewing its activity with the coming of the rains. It was found possible to carry the organism in an actively parasitic condition through its normal period of dormancy (December to April) by supplying constantly renewed young rice seedlings and keeping the air moist. This last is thought to be an indispensable condition, probably explaining the comparative immunity of the early crop and of the main crop in its earlier stages. The spring crop, which is, however, of minor importance, may not be liable to injury. The nematode does not appear to survive in the soil, as total destruction of all stubble is followed by a healthy crop. Extensive experimentation is in progress.

The work of the past two seasons has established the view that the parasitic species of Orobanche in Bihar are *O. indica* and *O. cernua*.

The work on the black thread disease of Hevea has been continued. This disease, which is active only during the monsoon rains, is not fatal but causes much damage by attacking the tapped area of the bark. The causal fungus, which is said to differ from *Phytophthora faberi*, attacks both bark and fruits at points of injury. The disease is favored by excessive humidity and shade. The fruits constitute the chief source of infection. *P. parasitica* found on *Vinca rosea* has been studied and germination of the oospores has been accomplished, the resulting organism corresponding in essentials with *P. erythroseptica* in Ireland.

The study of the opium poppy blight has led to the conclusion that while *Peronospora arborescens* is common and epidemic under favorable conditions, Rhizoctonia develops only under defective drainage conditions.

Colletotrichum nigrum causes a serious anthracnose of chilli peppers in several parts of India, the organism penetrating the pod and reaching the seed.

A plantain wilt prevalent at Pusa is said to be due to a Fusarium distinct from that causing the Panama disease. In severe cases the rot may reach the stem and kill the whole crown. Attack of the fruit stalk may lead to loss of the whole bunch. The fruit rot of plantain due to *Glœsporium musarum* is controlled by early spraying with Burgundy mixture and repeating this treatment every two weeks until the fruit is nearly ripe, when ammoniacal copper carbonate should be employed.

Polyporus shoreæ is the name given to what is considered a new fungus thought to cause a disease of sal trees and described on page 555.

The study of certain wilts of cotton, til, gram, chilli, and other crops has yielded no support to the view that such wilts are due to defective air supply for the roots or to other physical conditions in the soil, a Fusarium appearing to be the causal agent.

A brief account is given of the chief items of mycological work as carried out by other scientific departments (chiefly the provincial departments of agriculture), including the palm bud rot operations, a study of the black thread disease of Hevea, a disease of paddy (*Ephelis oryzæ*), a root disease of coffee

(*Fomes australis*), chilli disease (*Vermicularia capsici*), a leaf disease of turmeric (*V. curcumæ*), koleroga and a leaf disease of coffee, brown blight (*Colletotrichum camelliæ*) of tea, koleroga, (probably *Phytophthora arecæ*) of the areca palm, spike disease of the sandalwood tree, a Fusarium disease of the potato, mango mildew, a Nectria on fruit trees, smuts of jowar, grape mildew, loose smut of wheat, poppy blight (Rhizoctonia and Peronospora), and gray rim blight of tea.

Diseases and injuries to cultivated plants in the Dutch East Indies in 1916, C. J. J. van Hall (*Dept. Landb., Nijv. en Handel* [*Dutch East Indies*], *Meded. Lab. Plantenziekten, No. 29* (*1917*), *pp. 37*).—This is a general review, giving under the different economic plants condensed accounts of reports received from various centers on diseases observed, including injuries caused by some animal pests.

The rusts occurring on the genus Fritillaria, C. C. Rees (*Amer. Jour. Bot., 4* (*1917*), *No. 6, pp. 368–373, figs. 3*).—A key is given of *Uromyces æcidiiformis*, *U. miuræ*, *U. fritillariæ*, and *U. holwayi* with descriptions of all but the last named.

Bacterial blight of barley, L. R. Jones, A. G. Johnson, and C. S. Reddy (*U. S. Dept. Agr., Jour. Agr. Research, 11* (*1917*), *No. 12, pp. 625–644, pls. 4, figs. 2*).—In a contribution from the Wisconsin Experiment Station, a detailed account is given of a study of bacterial blight of barley, a preliminary note of which has been given (E. S. R., 35, p. 845).

This disease, which is said to be widely spread and capable of producing serious loss, somewhat resembles other bacterial diseases of cereals and allied plants, but it is considered distinct from these, being caused by a hitherto undescribed organism. The disease is characterized by the appearance on the leaves of small, water-soaked areas which enlarge to yellowish or brownish, somewhat translucent blotches or irregular stripes. Similar lesions may appear later on the glumes, but the chief injury is to the foliage. While there is considerable difference in varietal susceptibility to this disease, all of the main groups of barley are more or less subject to its attack.

Culture and inoculation experiments have been made with the organism which have proved it to be the cause of the disease. A technical description is given of the organism, which has been named *Bacterium translucens* n. sp. The inoculation experiments have shown that the disease may be readily induced on barley by spraying with water suspensions of the organism, but negative results were obtained from inoculations on oats, rye, wheat, spelt, emmer, einkorn, and timothy. The bacteria have been found capable of overwintering in infected leaves, but diseased kernels are considered the chief means of dissemination and source of spring infection.

No control measures have been worked out, but the authors consider avoidance of infected seed and seed disinfection as the most promising means of control.

Stinking smut and loose smut in wheat and barley (*Meded. Phytopath. Dienst Wageningen, No. 4* (*1917*), *pp. 24, pls. 5*).—A brief account is given of the distribution, symptoms, progress, and effects of some grain smuts, including *Tilletia tritici*, *Ustilago tecta hordei*, *U. tritici*, *U. nuda hordei*, *U. avenæ*, and *Urocystis occulta*, with control measures in some detail, including costs of a treatment employed in a cooperative plan.

Stinking smut is best controlled by steeping the seed in a copper sulphate or formalin solution, loose smut by immersion of the seed grain for 10 minutes in water heated, in case of barley, to 51° C. (123.8° F.), of wheat to 53°, after which it should be spread to dry before sowing.

Potato and tomato diseases, N. J. Giddings (*West Virginia Sta. Bul. 165 (1917), pp. 24, figs. 21*).—Descriptions are given of some of the most widely spread and destructive diseases of potatoes and tomatoes, with suggestions for their conrol.

For the prevention of these diseases, rotation of crops, selection of seed tubers and varieties, removal of diseased material, and thorough spraying with Bordeaux mixture are recommended.

In connection with the potato diseases, the author gives an account of an investigation to determine whether potato powdery scab was liable to become a serious menace in West Virginia. Badly diseased potatoes were planted in the field at the West Virginia Station, and at harvest time there was not the least sign of the disease on any of the tubers. This is believed to indicate that the southern conditions are unfavorable to powdery scab.

A summary is given of spraying experiments for the prevention of potato diseases, from which it appears, as a result of six years' work, that plats sprayed with 5:5:50 Bordeaux mixture gave increased yields of from 11 to 53.5 per cent. These experiments were conducted on a commercial scale and are believed to indicate the value of spraying even in seasons when neither early nor late blight was prevalent. Tests of commercial lime sulphur, which is sometimes recommended as a potato spray, gave results indicating that this material is not to be recommended for use on potatoes.

Our present knowledge of potato diseases: What they are and how to control them, H. A. Edson (*Proc. Potato Assoc. Amer., 3 (1916), pp. 52–56*).—The author gives a discussion of potato diseases, more particularly in the United States, including a leaf-bronzing trouble, now becoming prominent, which appears to be primarily of the malnutrition type, streak, mosaic, late blight (*Phytophthora infestans*), powdery scab, several diseases induced by *Fusarium* spp., blackleg, black scurf (Rhizoctonia), curly dwarf, and leaf roll.

It is thought that, aside from the specific measures mentioned in connection with these diseases, the most practical method for combating potato diseases is probably that of planting the best stock available in the best soil types, cultivating in the best manner, frequent roguing out of all undesirable plants, and careful selection of seed tubers.

Potato mildew or late blight, H. Bocher (*Vie Agr. et Rurale, 7 (1917), No. 21, pp. 369, 370*).—This is a brief account of the manifestations, attacks, prevalence, effects, and control of *Phytophthora infestans* on potatoes.

The organism is said to require temperatures between 20 and 30° C. (68 and 86° F.) and to be controllable by means of two or three treatments of the potato plants with Bordeaux mixture, the first to be applied before the plants have bloomed, in May or June, the second, 20 days later. A third may profitably be given in August, if applied very promptly on recognition of its necessity. Seed treatments are also discussed, including the use of copper sulphate and that of sulphuric acid. Some resistant varieties are named.

[The so-called Lahaina disease and other diseases of sugar cane], H. P. Agee (*Proc. Hawaii. Sugar Planters' Assoc., 36 (1916), pp. 18–20*).—It is stated that soil studies by Burgess continue to point to a correlation between the occurrence of black alkali and the failure of the cane variety known as Lahaina, which, though vigorous, gives way under various unfavorable environments. Tests following out this theory by treating the soil with gypsum or with green manure have not proved conclusive.

Infectious top rot is reported by Lyon to have appeared on Oahu and Maui during the year, though apparently confined to Kauai for the previous eight years. This disease, which is considered dangerous, was arrested by cutting and burning the affected canes.

A new and peculiar leaf spot was noted on a cane variety brought from Kauai, but the trouble rapidly disappeared.

A peculiar disease noted in Hawaii and characterized by early yellowing and death of the leaves is ascribed to a fungus attacking the leaf bases.

[The Lahaina disease of sugar cane], G. F. Renton (*Proc. Hawaii. Sugar Planters' Assoc., 36 (1916), pp. 57–61*).—The Lahaina trouble is said to have caused grave concern to many growers of sugar cane. The trouble is ascribed to various causes, such as top rot, stellar crystals at the roots, senility, excess of sodium bicarbonate due to poor drainage, or some combination of these causes.

On one plantation ammonium sulphate has been applied continuously from 1909 to 1917, except when an equal portion of sodium nitrate was added in 1911, resulting in a more or less regular diminution of the trouble. It is considered probable that conditions favorable to the growth of the Lahaina variety can be gradually brought about by using less sodium nitrate and more sulphates, including gypsum, and by conserving the trash, all of which measures oppose alkalinity. Breeding experiments are also recommended.

Diseases and pests of sugar cane in the Philippines, E. B. Copeland (*Philippine Agr. and Forester, 5 (1916), No. 10, pp. 343–346*).—A condensed account of animals and fungi locally injurious to sugar cane includes, as known representatives of the latter class, *Puccinia kuehnii* (leaf rust), *Ustilago sacchari* (smut), *Bakerophoma sacchari* (leaf spot), *Cercospora* spp. (leaf spots), *Phyllachora sacchari, Meliola arundinis, Apiospora camtospora, Coniosporium extremorum* and *C. vinosum* (on dead leaves), *Melanconium sacchari* (rind disease), and *Dyctyophora phalloidea*, and a Marasmius attacking the roots. A broom rape, *Arginetia indica*, is a root parasite on cane and other grasses.

It is supposed that most of the recognized cane pests and diseases are present at this time in the Philippines, owing to the antiquity of sugar culture and the presence of wild sugar cane in the islands.

Orchard diseases, J. F. Adams (*Proc. State Hort. Assoc. Penn., 58 (1917), pp. 69–77, pls. 5*).—This discussion emphasized a few of the more important diseases of apple and peach, more particularly scab (*Venturia pomi*), which is designated as the most serious of the orchard diseases, apple fruit spot or Baldwin spot (*Phoma pomi*), blotch (*Phyllosticta solitaria*), sooty blotch and fly speck (*Leptothyrium pomi*), with a schedule for the spraying of apples; peach scab (*Cladosporium carpophilum*), brown rot (*Sclerotinia cinerea*), and peach-leaf curl (*Exoascus deformans*), with a schedule for spraying peaches.

Apple scab and methods of its control, A. J. Gunderson (*Trans. Ill. Hort. Soc., n. ser., 50 (1916), pp. 357–364*).—Apple scab is thought to have caused more damage to apple orchards in northern Illinois during the past two years than any other factor, and it is thought that western New York and Michigan suffered even greater losses.

In addition to reducing the quality of the fruit, this disease increases premature dropping to a considerable extent and lowers the keeping qualities of the apple by furnishing conditions for the entrance of such organisms as those of pink rot, brown ripe rot, and black rot. Severe infection of the foliage also devitalizes the tree to a considerable extent, affecting future crops.

The occurrence of the organism on twigs is rare or unknown in Illinois. The disease is described as to the development and life history of the causal organism.

Bordeaux mixture and lime-sulphur were found to be of about equal value as regards the control of apple scab, but the former may russet the fruit and injure

the foliage, while the latter may burn the fruit if applied freely in very hot weather after July 1, though it favors high coloration and finish and vigorous foliation. Lead arsenate is said to increase the fungicidal effectiveness of lime-sulphur. Four applications are ordinarily required for primary apple-scab infection, or more in a wet season, such as that of 1915. Late fall or early spring plowing is recommended to reduce the infection.

Spraying experiments in 1916 for the control of apple blotch, A. J. GUNDERSON (*Trans. Ill. Hort. Soc., n. ser., 50 (1916), pp. 248–251*).—Reviewing previous work and conclusions by several investigators, the author notes briefly the results of tests made at Flora, Clay County, Ill., in 1916 against apple blotch on 108 16-year-old Ben Davis trees, employing different fungicides.

Bordeaux mixture (3:4:50) proved superior to lime-sulphur (2½ gal. to 100 gal. water) as regards protection, though it showed some russeting of the fruit. Both these sprays are regarded as valuable for protection if used three, five, and seven weeks after the fall of the blooms. It is not advisable to alternate these sprays.

Points which were emphasized in the course of these observations were that unpruned trees or trees with dense tops do not permit thorough spraying, that low pressures are absolutely inadequate as regards apple blotch control, that every part of the tree must be reached and covered, and that applications must be made at the proper times in order to be successful.

Results of spraying experiments at the Neoga Station, Cumberland County, 1916, W. S. BROCK (*Trans. Ill. Hort. Soc., n. ser., 50 (1916), pp. 252–273*).—The spraying at Neoga, Ill., during 1916 is said to have demonstrated that a dust mixture should contain only active ingredients, of which from 80 to 90 per cent may be fungicidal, the rest insecticidal. Even distribution of dust sprays requires exceeding fineness of materials, so that the dust will remain suspended in the air as long as possible, enveloping the tree in a dense cloud.

Liquid sprays are deemed superior to dust sprays as at present applied, though the latter have some advantages in favored localities, their place being rather that of a supplemental application or a means of reaching the trees in time where breakdowns or failure of water supply make liquid sprays unavailable. It may develop later from work to be done that certain applications, such as the follow-up spray or that applied 10 days after blooming, should employ the dust mixture.

Figures are given on costs and on the relative effectiveness of sprays on insects, scab, blotch, and sooty blotch. It is concluded that liquid sprays are more efficient, they can be applied during high or shifting winds, they cost less, and they can be used as dormant sprays; while dust sprays can be applied more quickly and require fewer men and teams.

One season's experience with the dust spray, W. S. PERRINE (*Trans. Ill. Hort. Soc., n. ser., 50 (1916), pp. 470–472*).—It was found that a great saving in equipment and time could be effected by substituting the dust for the liquid form of spray. Almost perfect results were obtained with early apples, but conditions and results were less favorable in case of late apples. A combination of liquid and dust gave very excellent results. Peaches on which dust alone was used also showed decided benefit from the treatment.

A bacterial disease of the Wragg cherry, W. G. SACKETT (*Jour. Bact., 2 (1917), No. 1, pp. 79, 80*).—A disease observed by the author first in the summer of 1915 and kept under observation for further reports causes spots or specks on cherries (which appear to start only before ripening), also on the stems (the cherries sometimes dropping prematurely), leaves (causing a shot-hole appearance), and young twigs (causing watery, elliptical, olive-brown dis-

colorations surrounding the lenticels, which elongate with age and become somewhat sunken and darker in color). The disease appears almost identical with the bacterial disease of peach and plum ascribed to *Pseudomonas* (*Bacterium*) *pruni* but not known to have been found previously on the cherry, of which only the Wragg variety appears to be affected.

Spraying experiments with self-boiled lime-sulphur reduced the fruit injury from 41.4 to 10.2 per cent.

Abnormal blossoms on black currant, R. G. HATTON and J. AMOS (*Gard. Chron., 3. ser., 61* (*1917*), *No. 1584, p. 180, figs. 3*).—Black currant bushes at the Wye Station under observation for two seasons have shown, in a bush that was conspicuously nettle headed, a further abnormality in which the fruiting spurs of the abnormal inflorescence consisted of one or more single blossoms, each on a short pedicel, together with several racemes, the abnormal condition of the blossoms differing in the two instances as described. Both types of abnormal blossom appeared on each spur and were fairly frequent over the whole bush, which showed no normal flowers and set no fruit. The observations are to be continued.

A new disease of grapevines, Acarinosis in Navarra, A. AZANZA (*Prog. Agr. y Pecuario, 23* (*1917*), *Nos. 999, pp. 64, 65; 1001, pp. 89–91; 1007, pp. 158–160; 1012, pp. 221–223; 1014, pp. 245–247*).—This is a discussion of the anomaly of grapevine said to be known universally in France as court noué, of the work and the views of various investigators thereon, of the damage suffered in connection with this condition of grapevines, of more or less similar conditions as variously reported, of somewhat inconclusive experimentation testing for transmissibility of this condition, of the organisms found in connection therewith, of the probability of a connection between court noue and the occurrence of acarids on the vines, of the conditions apparently related to the occurrence of the trouble (weather, soils, and age of the vines), and of remedial measures.

Prevention of mildew outbreak, J. CASCÓN (*Prob. Agr. y Pecuario, 23* (*1917*), *No. 999, pp. 70, 71*).—This is a discussion of the preparation and use of Bordeaux mixture or of copper acetate for grape downy mildew. The period between the swelling of the buds and the opening of the blooms is considered a time of great danger to the plant on account of the rapid growth and exposure of susceptible surfaces to the infection.

Control measures against grape downy mildew, V. C. MANSO DE ZÚÑIGA (*Prog. Agr. y Pecuario, 23* (*1917*), *No. 1009, pp. 182–184*).—This contains reference to results of work in 1915 as bearing upon the problems of the current year, and more particularly as showing the efficacy of copper sprays, when properly made and used, against grape downy mildew.

Copper sulphate and copper sprays, V. C. MANSO DE ZÚÑIGA (*Prog. Agr. y Pecuario, 23* (*1917*), *No. 1007, p. 163*).—As the result of tests at the Haro station, it has been found possible to reduce the copper sulphate in the sprays employed against grape downy mildew to 0.5 per cent by employing casein. The reduction of the copper content to 0.25 per cent has not proved successful.

Treatment of grape downy mildew and Oïdium, V. C. MANSO DE ZÚÑIGA (*Estac. Enol. Haro Mem., 1916, pp. 40–47*).—As the result of tests with fungicides for use against grape Oïdium and downy mildew, it is stated that Bordeaux mixture with casein proved to be as effective at 1 per cent strength as without casein at 2 per cent. A preparation of very high basicity produced serious injury in all tests.

A bacterial spot of citrus, ETHEL M. DOIDGE (*Ann. Appl. Biol., 3* (*1917*), *No. 2–3, pp. 53–81, pls. 11*).—An account is given of a citrus disease in the western part of the Cape of Good Hope. The primarily causal organism is described as a new species (*Bacillus citrimaculans*). It is symptomatically characterized

by dark sunken spots on the fruit and shoot. The infection gives entrance to fungi which destroy the fruit.

A bacterial spot of citrus fruits, Ethel M. Doidge (*Agr. Jour. So. Africa, 2 (1915), No. 11, pp. 180–182, pls. 2*).—This is a condensed account of the disease noted above.

Bud rot of the coconut palm, C. H. Knowles (*Dept. Agr. Fiji Pamphlet 20 (1916), pp. 2*).—A brief general account of coconut bud rot in other places is followed by a sketch of conditions noted in Fiji, with suggestions regarding points to be observed in suspected cases.

Investigation of diseases of the rose (*Gard. Chron. Amer., 21 (1917), No. 6, p. 245*).—Investigations carried on since August 1, 1916, in northeastern United States are said to show that the more important rose diseases prevalent, in their order, are black spot, mildew, crown gall, stem canker, Phyllosticta leaf spot, rust, bud rot, and miscellaneous leaf spots. Fungi and bacteria causing other diseases are being studied.

A disease which appears to be new and important is briefly described under the name crown canker. Specimens have been sent in from many points extending as far west as Missouri. It was first observed by the author in September, 1916, but has possibly been present for four or five years. All rose varieties appear to be susceptible. The attack occurs just beneath the soil surface, advancing slowly, but killing the plant eventually after a decline in the number and quality of the flowers. Control experiments are now under way. The fungus is thought to live in the soil and to necessitate soil sterilization when the organism has once gained a foothold.

Montana forest tree fungi.—I, Polyporaceæ, J. R. Weir (*Mycologia, 9 (1917), No. 3, pp. 129–137, pl. 1*).—The present list, confined to the Polyporaceæ, is the first part of a classified record intended to include the names of all forest tree fungi of importance to be found in Montana.

Observations on forest tree rusts, J. R. Weir and E. E. Hubert (*Amer. Jour. Bot., 4 (1917), No. 6, pp. 327–335, figs. 2*).—It is suggested, in view of comparisons made (pending a study of cultures which is considered necessary for final determination), that *Uredinopsis copelandi* be considered as identical with *U. pteridis*, a technical description of the æcial stage of which is given.

Data briefly noted indicate the presence of a biological species of *Pucciniastrum pustulatum* occurring on *Epilobium adenocaulon* and overwintering by means of mycelium and uredinia upon the rosettes which live until spring.

Studies carried out on *Coleosporium solidaginis* occurring on Aster and Solidago are said to confirm the conclusions of Mains (E. S. R., 36, p. 647) regarding the wintering habit of this fungus.

A practical method of preventing the damping-off of coniferous seedlings, C. A. Scott (*Jour. Forestry, 15 (1917), No. 2, pp. 192–196, pls. 2*).—A method said to be practical and highly satisfactory is described of sterilizing forest nursery seed beds with steam delivered at 120 to 160 lbs. pressure for from 35 to 45 minutes under inverted pans previously weighted down. This plan has stood the test of use for two seasons very favorable to the fungus, causing the damping-off of coniferous seedlings, except in the case of the Engelmann spruce. The unsterilized beds of all species showed almost a total loss. Germination in the sterilized beds occurred from two to four days earlier and was more nearly complete, giving a considerable saving in the cost of seeds. This methods also destroys all weed seeds, thus eliminating the cost of weeding and counterbalancing thereby the entire expense of sterilizing the beds. The seedlings in the sterilized beds made a much more vigorous growth, attaining

before the close of the growing season from two to four times the size of those on the untreated beds.

How to preserve the oaks, L. DANIEL (*Compt. Rend. Acad. Sci.* [*Paris*], *164* (*1917*), *No. 25, pp. 957–959*).—The injury done to oaks by mildew since 1908 is attributed largely to the defective methods of lopping in vogue, the resulting changes in the form of the tree and the disturbance of equilibrium between the fundamental processes culminating in a greater degree of susceptibility.

Hevea canker, III, A. A. L. RUTGERS (*Dept. Landb., Nijv en Handel* [*Dutch East Indies*], *Meded. Lab. Plantenziekten, No. 28* (*1917*), *pp. 49, pls. 12, figs. 2*).—Reporting further (E. S. R., 37, p. 458) on Hevea canker, the author states that the stripe canker, which shows a decay of the renewing bark and appears only during the very wet weather of the rainy season, may be induced artificially by applying conidia suspended in water to the wounds made by tapping. The black lines enlarge and may so fuse as to cover the whole surface of the renewing bark. Transition stages between stripe canker and ordinary canker may be found. The disease may spread with exceptional rapidity where tapping is kept up or where water is used on the tapping cuts. Carbolineum, formerly used as an antiseptic at 50 per cent concentration, is now used at 20 per cent, and it is thought that this may be safely reduced perhaps to 5 per cent.

Both forms of canker are due to *Phytophthora faberi.* Canker patches of the ordinary sort are produced by inserting mycelium into an incision in the old bark. Bur formation of a certain sort described is regarded as a symptom of canker. Under favorable circumstances the trees recover from light attacks provided tapping is stopped.

The Phytophthora forms from Hevea, cacao, and nutmeg are said to belong to the same species. The strain from cacao is more virulent for that host and for Hevea, and the nutmeg strain for its own host. Comparisons of pure cultures are said to show that morphologically the four forms *P. faberi*, *P. nicotianæ*, *P. colocasiæ*, and *P. jatrophæ* are distinct species, the last named being of the type of *P. infestans*, and *P. fagi* and *P. cactorum* being quite different from the others.

Preventive measures considered as most important for canker include thinning, drainage, and removal of intercrops, pruning having been abandoned. Direct measures include cutting out the red patches of canker and the application of carbolineum to the stripe cankers. The disease should be detected early and tapping stopped.

It is thought from very recent experiments that stripe canker can be prevented entirely. *P. faberi* can attack unwounded fruit, causing a rot which may spread very rapidly. Drosophila appears to be an active agency in spreading the disease. The burs found on Hevea trunks may be the result of leaf scars, pricking, or canker. Of the last named there are two forms, one deep-seated, the other due to secondary wood formation in the cortex and curable by stopping the tapping and treating the cankers.

Abnormal leaf fall of Hevea rubber, W. McRAE (*Planters' Chron.*, *11* (*1916*), *No. 37, pp. 459–465*).—This is a report of a lecture before the United Planters' Association of South India in which the speaker discussed some preliminary studies of a disease which is now attributed to a Phytophthora hitherto but little known on rubber plantations, having been first mistaken for *P. faberi.* The effects of the disease on the different parts of the plant are described. It was first definitely noted as a fruit rot, but is now also characterized by an abnormal shedding of leaves from June to August.

Polyporus shoreæ (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 3* (*1916*), *p. 72*).—A fungus suspected to cause a serious disease of sal (*Shorea robusta*) is described under the name of *P. shoreæ*. The effect on the wood is said to be similar to that produced by *Trametes pini*, but more marked.

The black zones formed by wood-destroying fungi, A. S. RHOADS (*Syracuse Univ.* [*Pubs.*], *17* (*1917*), *No. 28, pp. 61, figs. 7*).—This is the beginning of an attempt to throw some light on the nature and significance of the black lines or zones of decay which accompany several fungi in many kinds of wood. These are said to indicate the first stage of decomposition in dicotyledonous woods, but may also be found in wounds in such trees while living or when but newly fallen, even before the presence of fungi can be demonstrated, being in this case due solely to oxidation of the woody substance. These decomposition products are said to arise only after the death of the cells through the oxidation of their contents and certain constituents of the cell walls, this formation occurring most notably in the parenchyma cells, which are infiltrated, causing the appearance of blackish zones of varying thickness. Wood thus infiltrated is to be considered as pathological heartwood. The blackish zones move forward with the advance of decay and disappear with its completion in a given region. In coniferous woods the formation of these decoloring decomposition products is relatively insignificant. Three factors said to be necessary are the presence of dead cells, an optimum supply of moisture, and sufficient oxygen to supply the needs of the oxidation process.

The partially decomposed material of woody plants forms a particularly vague and indefinite group of substances containing the nonvolatile products of the action of fungi, enzyms, and oxygen, all of which are exceptionally resistant to chemical reagents.

It is possible to prepare, by oxidizing fresh sapwood, a product resembling that resulting from decomposition in various woods, either in wounded areas of living trees, in dead wood, or as the result of the activity of wood-destroying fungi. Decomposition products resembling the so-called wound gum are caused by oxidation or else by wood-destroying fungi which hasten the decomposition and hence the oxidation.

Damage by spurs, J. L. RICHARDS (*Mass. Forestry Assoc. Bul., 117* (*1915*), *pp. 25–27, pls. 3*).—An account of the admission of destructive nematodes and fungi, including chestnut blight, by way of the wounds made by climbing irons, which leads to the conclusion that spurs should not be used on valuable trees.

Tests with chemicals on control of nematodes, T. A. C. SCHOEVERS (*Meded. Rijks Hoogere Land, Tuin en Boschbouwsch.* [*Wageningen*], *12* (*1917*), *No. 1, pp. 46–48*).—The author reports some preliminary tests with several chemicals in attempting to control *Heterodera radicicola* in roots of tomato plants. He states that lime mixed with ammonium sulphate gave the best results, but that these were almost equaled by those from naphthalin and those from formalin. Two compounds tested seemed rather to favor the development of the nematodes.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The vertebrate zoologist and national efficiency, W. P. TAYLOR (*Science, n. ser., 46* (*1917*), *No. 1180, pp. 123–127*).

Conservation of game in the National Forests and National Parks, E. W. NELSON (*Amer. Forestry, 23* (*1917*), *No. 279, pp. 139–145, figs. 10*).

What Big Lake [Reservation] means as a game refuge, G. W. FIELD (*Wild Life, 1* (*1917*), *No. 1, pp. 5, 15, fig. 1*).

Rio Grande bird reservation, New Mexico, G. WILLETT (*Reclam. Rec.* [*U. S.*], *8* (*1917*), *No. 4, pp. 190, 191, fig. 1*).

A visit to the heronry at Walker Lake.—Even the egret, once on the verge of extinction, is coming back on this fine sanctuary, R. A. HOLLAND (*Wild Life, 1 (1917), No. 2, p. 9*).

Lost and disappearing wild birds of Missouri, W. L. MCATEE (*Wild Life, 1 (1917), No. 2, pp. 7, 16*).

The birds of the Anamba Islands, H. C. OBERHOLSER (*U. S. Nat. Mus. Bul. 98 (1917), pp. 75, pls. 2*).

Birds collected by Dr. W. L. Abbott on various islands in the Java Sea. H. C. OBERHOLSER (*Proc. U. S. Nat. Mus., 54 (1917), pp. 177–200*).

The status of Aphelocoma cyanotis and its allies, H. C. OBERHOLSER (*Condor, 19 (1917), No. 3, pp. 94, 95*).

Notes on the fringilline genus Passerherbulus and its nearest allies, H. C. OBERHOLSER (*Ohio Jour. Sci., 17 (1917), No. 8, pp. 332–336*).

A review of the subspecies of the leach petrel, Oceanodroma leucorhoa, H. C. OBERHOLSER (*Proc. U. S. Nat. Mus., 54 (1917), pp. 165–172*).

The relationships of the fossil bird Palaeochenöides mioceanus, A. WETMORE (*Jour. Geol., 25 (1917), No. 6, pp. 555–557, fig. 1*).

How to attract birds in the East Central States, W. L. MCATEE (*U. S. Dept. Agr., Farmers' Bul. 912 (1918), pp. 14, figs. 11*).—This, the fourth of a series of bulletins describing the best methods of attracting birds in various parts of the United States (E. S. R., 38, p. 53), covers the territory west of Pennsylvania, north of Tennessee, and east of the one-hundredth meridian.

The agricultural value of bird life in Louisiana, H. H. KOPMAN (*Mod. Farming, 47 (1917), No. 12, pp. 3, 4*).—This account includes a brief report of several bird counts made on farm land in Louisiana during the breeding season of 1915.

On the life history of a soil ameba, C. W. WILSON (*Univ. Cal. Pubs. Zool., 16 (1916), No. 16, pp. 241–292, pls. 6*).—A detailed report of studies of the life history of *Naegleria gruberi*, pure mixed cultures of which were maintained under laboratory conditions for a period of two years. In these cultures encystment and excystment, enflagellation and exflagellation, and exogenous and endogenous budding were observed and are described. A bibliography of 45 titles is included.

Ninth annual report of the State entomologist of Indiana, F. N. WALLACE (*Ann. Rpt. State Ent. Ind., 9 (1915–16), pp. 230, figs. 132*).—This report includes papers on Some Injurious Insect Pests of the Year (pp. 23–47) which incorporates a paper by M. E. Kinsey on the Onion Thrips; Some Common Diseases of Vegetables (pp. 77–90) and Directions for Sterilizing Soil in Plant Beds and Greenhouses (pp. 91–96), by J. B. Demaree; Report of the State Inspector of Apiaries (pp. 98–104); and Some of the Important Insect Pests of Indiana, by R. E. Snodgrass (pp. 105–225).

Report of the entomologist for 1916, H. A. SURFACE (*Penn. Dept. Agr. Bul. 290 (1917), pp. 65–70*).—This is the usual annual report (E. S. R., 37, p. 459).

Report of the Dominion entomologist for the year ended March 31, 1916, C. G. HEWITT (*Canada Dept. Agr., Rpt. Dominion Ent., 1916, pp. 73, pls. 4*).—This reports on the work of the year under the headings of the administration of the Destructive Insect and Pest Act; introduction of parasites and predatory enemies of the brown-tail and gipsy moths; insects affecting cereal and other field crops, garden, and greenhouse; and insects affecting forest and shade trees. Summary reports of the work carried out at the field laboratories follow.

[Insects of economic importance in Cuba] (*Sec. Agr. Cuba, Com. Sanid. Veg., Bul. 1 (1917) [English Ed.], pp. 36–43, 52–66, 67–77, pls. 22*).—The injury caused to sugar cane by *Pseudococcus sacchari* (pp. 36–38) and by the cercopid

Monecphora bicincta (pp. 38–43), particularly to parana grass (*Panicum numidianum*) in Camaguey, is reported upon. A list is given of the insects and diseases of economic importance in Cuba arranged according to their host plants (pp. 52–66), and an account of the occurrence of the spiny citrus white fly (*Aleurocanthus woglumi*) in Cuba, including a list of host plants (pp. 67–77), references to which have been previously noted (E. S. R., 38, p. 462; 38, p. 158).

[Entomological investigations] (*Hawaii. Sugar Planters' Assoc., Rpt. Expt. Sta. Com., 1917, pp. 6–11*).—This is a summary of the entomological work at the Hawaiian Sugar Planters' Station. Particular attention was given to work with the natural enemies of the Anomala beetle.

[Hawaiian insects] (*Proc. Hawaii. Ent. Soc., 3 (1916), No. 4, pp. 270–272, 274, 276–280, 287, 288, 292–294, 296–368, figs. 61*).—The papers here presented include the following: Notes on Two Species of Hawaiian Diptera (*Brachydeutera argentata* and [*Homalomyia*] *Fannia pusio*) (pp. 270–272), *Clerada apicicornis* Sucking Blood (p. 274), and Webbing Clothes Moth (*Tineola biselliella*) Predacious (p. 274), by J. F. Illingworth; Notes on a Peregrine Bethylid (*Epyris extraneus* n. sp.) (pp. 276–279) and Notes on *Dictyophorodelphax mirabilis* (pp. 279, 280), by J. Bridwell; Notes on the Life History of *Attagenus plebius*, by J. F. Illingworth, an account of which has been previously noted (E. S. R., 37, p. 567) (pp. 287, 288); Description of a New Species of Spalangia, *S. philippinensis*, a parasite of the horn fly (*Lyperosia irritans*) introduced from the Philippines in 1914, by D. T. Fullaway (pp. 292–294); Exhibition of "Types" of Some Recent Hawaiian Lepidoptera [41 species], by O. H. Swezey (pp. 296, 297); New Hawaiian Delphacidæ, including descriptions of 1 genus and 15 species and subspecies new to science (pp. 298–311) and Homopterous Notes, including descriptions of 26 new species (pp. 311–338), by F. Muir; Reference Tables of the Hawaiian Delphacids and of Their Food Plants, by W. M. Giffard (pp. 339–348); and Economic Aspects of our Predacious Ant (*Pheidole megacephala*), by J. F. Illingworth (pp. 349–368).

Annual report for 1916 of the zoologist, C. Warburton (*Jour. Roy. Agr. Soc. England, 77 (1916), pp. 222–234, figs. 4*).—This consists in large part of a report upon the occurrence of some of the more important insects.

British insects and how to know them, H. Bastin (*London: Methuen & Co., Ltd., (1917), pp. 129, pls. 12; rev. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 7, p. 327*).—This is a small text-book comprising a popular introduction to the study of British insects.

Insect and arachnid pests of 1916, R. S. MacDougall (*Trans. Highland and Agr. Soc. Scot., 5. ser., 29 (1917), pp. 116–152, figs. 25*).—This reports observations of the occurrence, etc., of the more important insect and arachnid pests of the year (E. S. R., 36, p. 252).

Imported insect pests, C. Vrooman (*Country Gent., 82 (1917), No. 43, pp. 12, 13, figs. 8*).

Grass and clover insects, C. R. Crosby and M. D. Leonard (*N. Y. State Col. Agr., Cornell Ext. Bul., 20 (1917), pp. 20, figs. 18*).—A popular account of the more important grass and clover insects.

Chortophila cilicrura and Thereva sp., pests of rye in Silesia, Germany, Oberstein (*Ztschr., Pflanzenkrank., 26 (1916), No. 5, pp. 277–280; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 10, pp. 1558, 1559*).—In Silesia during the period 1914–15 it was observed that over a vast area the leaves of rye were completely devoured by *C. cilicrura*. Corn was attacked, but not to the same extent as rye, and lupines that followed rye were also attacked. Another pest, an undetermined species of the dipterous genus Thereva, is also mentioned as attacking rye.

[Potato and alfalfa insects], E. ESCOMEL (*Bol. Min. Fomento* [*Peru*], *No. 6* (*1917*), *pp. 41–51*).—The potato aphid (*Macrosiphum solanifolii*), a small crustacean (*Omiscus murarios*), and a lepidopteran are reported as injuring the potato, and the red spider (*Tetranychus telarius*) as injuring alfalfa.

Insects affecting vegetables, C. J. S. BETHUNE (*Ontario Dept. Agr. Bul. 251* (*1917*), *pp. 32, figs. 44*).—A popular summary of information.

The rôle of insects as carriers of fire blight, H. A. GOSSARD (*Rpt. Proc. Mont. State Hort. Soc., 19* (*1916*), *pp. 84–90*).—Substantially noted from another source (E. S. R., 35, p. 662).

Insects affecting coffee in Porto Rico, R. H. VAN ZWALUWENBURG (*Jour. Econ. Ent., 10* (*1917*), *No. 6, pp. 513–517*).—A brief report of observations of the insect pests of coffee in Porto Rico, in which the coffee leaf miner (*Leucoptera coffeella*), the coffee leaf weevil (*Lachnopus* sp.), and the coffee shade ant (*Myrmelachista ambigua*) are given particular attention.

A summary of our knowledge of insect vectors, M. E. MACGREGOR (*Jour. Trop. Med. and Hyg.* [*London*], *20* (*1917*), *No. 18, pp. 205–209*).—This is a summary of our knowledge of the more important insect-borne diseases and their vectors, much of the data being presented in tabular form.

On the selection and breeding of desirable strains of beneficial insects, C. W. MALLY (*So. African Jour. Sci., 13* (*1916*), *No. 5, pp. 191–195*).—The author here discusses the possibility of developing desirable strains of beneficial insects, particularly as relates to the lady beetle.

Crop pest controls, J. G. SANDERS (*Penn. Dept. Agr., Bur. Econ. Zool., 1917, n. ser., Circs. 3, pp. 15; 4, pp. 9*).—These circulars consist of brief summaries of information on insect pests and control measures.

When does the cost of spraying truck crops become prohibitive? V. I. SAFRO (*Jour. Econ. Ent., 10* (*1917*), *No. 6, pp. 521–523*).—The author suggests the following rule:

"The cost of spraying truck crops for pests that threaten to destroy all or a large part of the crop does not become prohibitive until the immediate application in view, together with such following farm operations as can be definitely foreseen, have a total cost in excess of the reasonable expectation of gross returns from the crop in question."

A device for sowing grasshopper poison, T. H. PARKS (*Jour. Econ. Ent., 10* (*1917*), *No. 6, pp. 524, 525, pl. 1*).—The author describes and illustrates a seeder for applying poison bran mash over large areas, improvised during a grasshopper campaign in western Kansas. It consists of a canvas bag which is strapped over the shoulder of the operator and fitted with a feeding device consisting of a canvas sleeve and swinging tube made of tin or galvanized iron.

A suggestion for the destruction of cockroaches, C. W. HOWARD (*Jour. Econ. Ent., 10* (*1917*), *No. 6, p. 561*).—The author's experiments show that exposures to temperatures of from 122 to 140° F. for 20 minutes; 24° for 3 hours; 18° for 20 minutes; 10° for 5 minutes; and 0° for from 5 to 10 minutes will destroy 100 per cent of the croton-bugs (*Blatella germanica*).

Experiments on the physiology of digestion in Blattidæ, E. W. SANFORD (*Proc. Soc. Expt. Biol. and Med., 13* (*1916*), *No. 8, p. 193*).—The author's investigations, which confirm the earlier work of Petrunkevitch (E. S. R., 11, p. 767), show that fat is split to soluble products and absorbed in large amount in the crop of the cockroach.

Sex determination in Anthothrips verbasci, A. F. SHULL (*Genetics, 2* (*1917*), *No. 5, pp. 480–488*).—A report of work with the mullein thrips carried on in continuation of that previously noted (E. S. R., 36, p. 252). It is shown that virgin females produce only male progeny.

Key to the species of Leptoglossus occurring north of Mexico, E. H. GIBSON (*Psyche, 24* (*1917*), *No. 3, pp. 69–73*).

On the possibility of the transmission of plague by bedbugs, J. W. CORNWALL and T. KESAVA MENON (*Indian Jour. Med. Research, 5* (*1917*), *No. 1, pp. 137–159*).—The authors find that bedbugs fed on a case of septicemic plague are a potential source of danger.

"Meals which contain bacteria are frequently fatal to bugs. On occasion bugs may survive an infection with *Bacillus pestis* for 38 days, and the bacillus may be recovered from their stomachs by culture at the end of that time. Bugs can not regurgitate their stomach contents in the act of feeding. If, therefore, bugs transmit plague by biting, they must do so by washing out with the saliva bacilli which have been stranded in their sucking tubes. Bacilli are not likely to remain in the sucking tube for long after an infected feed.

"It can not yet be stated for certain whether bugs can or can not transmit plague by biting. The likelihood of the transmission of human plague by bugs in biting under natural conditions is small."

The hop redbug (Paracalocoris hawleyi), I. M. HAWLEY (*Jour. Econ. Ent., 10* (*1917*), *No. 6, pp. 545–552, pl. 1, figs. 8*).—Each year since 1913 this pest has increased in numbers and caused more and more injury in hopyards about Waterville, N. Y., especially in the vicinity of Sangerfield, by perforating the leaves and stunting and deforming the stems. The initial injury is made evident by many light spots in the still unfolded leaves.

An account of its life history is accompanied by technical descriptions of its several stages, including five nymphal instars. The overwintering eggs are laid in hop poles from the middle of August until September and hatch the following year from June 1 until nearly the first of July. The nymphal period lasts about 30 days, the adults beginning to appear about the first of July.

Several predators are mentioned as natural enemies, including *Apeteticus maculiventris*, *Reduviolus subcoleoptratus*, and *Trombidium* sp. Blackleaf 40, at the rate of 1 pint to 100 gal. of water with 6 lbs. of soap, applied on July 17, apparently killed at once. In order to be successful the spraying should be done about the third week in June before the vines have produced large arms.

A contribution to the knowledge of the biology of Tingis pyri, D. DURANTE (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 11* (*1917*), *pp. 282–290; abs. in Rev. Appl. Ent., Ser. A, 5* (*1917*), *No. 8, p. 342*).—A report of observations of this pest made during the spring of 1914 on apple trees on which an outbreak had occurred the previous summer.

The apple and pear are the cultivated plants in Italy usually attacked, although a case was observed where an infestation of a plum tree took place from nearby apple trees. The following sprays were found to give satisfactory control: (1) Petroleum 1 lb., soft soap 1 lb., and water 10 gal., or (2) soap 2 lbs. and water 10 gal., and (3) soft soap 1 lb., carbolic tobacco extract 1 lb., and water 10 gal.

A few notes chiefly on the names of nearctic Tingidæ, W. L. MCATEE (*Bul. Brooklyn Ent. Soc., 12* (*1917*), *No. 4, pp. 78, 79*).

Key to the nearctic species of Leptoypha and Leptostyla, W. L. MCATEE (*Bul. Brooklyn Ent. Soc., 12* (*1917*), *No. 3, pp. 55–64*).

Amphiscepa bivittata in its relation to cranberry, H. B. SCAMMELL (*Jour. Econ. Ent., 10* (*1917*), *No. 6, pp. 552–556, pl. 1*).—This is a report of observations of the biology of the fulgorid *A. bivittata*, made during the course of cranberry insect investigations in New Jersey and on which but little has been previously reported. The author suggests that, since this insect is commonly associated with the cranberry and attacks the woody stems and not the foliage of

the plant, it be called the cranberry vinehopper in preference to the name "broad-winged leaf-hopper" by which it has been known.

Though the pest is said to be essentially one of secondary importance, being found only on vines in an unthrifty or dying condition, due to injury by other insects or drought, it has been taken in every cranberry section of the State. The author has reared the nymphs from egg punctures made in the wood of the swamp blueberry (*Vaccinium corymbosum*) as well as from cranberry. One generation a year is produced, hibernation taking place in the egg stage either on winter flooded bogs or those not flooded at any time.

Effective remedy consists of the removal of the major insect pests and the general improvement of conditions of vine growth by better cultural methods, such as pruning, sanding, and the application of fertilizers. Reflowing the bog about August 1 for a period of 24 hours, at which time the nymphs will have hatched and no eggs have been laid by the new adult, is suggested. A light wind will blow the bugs to one shore, where they may be killed by the use of a kerosene-burning spray torch.

The family Isometopidæ as represented in North America, E. H. Gibson (*Bul. Brooklyn Ent. Soc., 12 (1917), No. 4, pp. 73–77*).—Three species are described as new and the genus Lidopus erected.

A key to the species of Dictyophara, E. H. Gibson (*Bul. Brooklyn Ent. Soc., 12 (1917), No. 3, pp. 69–71*).

The pear woolly aphis, W. M. Davidson (*Mo. Bul. Com. Hort. Cal., 6 (1917), No. 10, pp. 390–396, figs. 2*).—This paper, based upon the studies of *Eriosoma pyricola* previously noted (E. S. R., 35, p. 463), includes later observations and a brief discussion of control measures.

In the control work miscible oil, kerosene oil emulsion, and distillate oil emulsion were used at proper strengths with success in controlling aphis on the roots of young orchard trees. Carbon bisulphid injected into the soil in liquid form proved satisfactory both on young orchard trees and in the nursery, although there is some danger to the trees in its use.

The box elder aphid (Chaitophorus negundinis), R. L. Webster (*Iowa Sta. Bul. 173 (1917), pp. 95–121, figs. 12*).—This account deals largely with biological studies of *C. negundinis*, a plant louse which quite generally infests the box elder, one of Iowa's common trees. In that State nearly all box elders are infested by the pest and often to such an extent that it becomes a great nuisance. It was particularly obnoxious in southwestern Iowa in 1908 and in 1910 was so abundant throughout the State that the box elder foliage was very light. Although the box elder (*Acer negundo*) is the only plant on which this species is abundant, the insect has been recorded by Sanborn on catalpa. It is recorded as occurring from Manitoba and Ontario in the north south to Las Vegas, N. Mex., and from New York in the East and California in the West, though most abundant in the States of the Upper Mississippi Valley. It appears to be a native species, having been originally described by Thomas from Illinois in 1878.

The egg, in which stage the winter is passed, hatches early in the spring just as the box elder buds are ready to burst and on which the young soon begin to feed. Early in June or even late in May normal forms give birth to dimorphs and from then on, during July and August, only the dimorphic forms are generally found on the leaves. The author has observed the dimorphs to molt twice, after which they become normal forms that become active late in August or early in September, and when mature give birth to normal forms. It is pointed out that the presence of these dimorphs in midsummer accounts for the fact that for about three months but little damage is done to box elders, the dimorphs remaining on the leaves, entirely inactive. Due to this fact it is very difficult to

control the plant lice by spraying infested trees when only the dimorphs are present since they lie so flat on both the upper and lower surfaces of the leaves that it is difficult to reach any large percentage of them with the spray. The true sexes appear in October and eggs are deposited on the bark, twigs, and branches of the trees. Observations of 12 generations are recorded, the dimorphs having first appeared in the fourth and in the four succeeding. It is thought that under normal conditions there are six or seven generations including a generation of dimorphs in midsummer. Technical descriptions are given of the several forms.

Syrphid flies are its most important natural enemies, two species, *Allograpta obliqua* and *Syrphus americanus*, having been common at Ames in 1912. The larvæ of an agromyzid species (*Leucopis* sp. near *griseola*) and a cecidomyiid (*Aphidoletes* sp.) were observed by the author to feed upon this aphid. Among other predacious enemies observed are several species of lady beetles (*Hippodamia convergens*, *Cycloneda sanguina*, *Adalia bipunctata*, and *Scymnus americanus*), the insidious flower bug (*Triphleps insidiosus*), a capsid (*Plagiognathus annulatus*), chrysopid larvæ (*Chrysopa nigricornis*, *C. plorabunda*, and *C. oculata*), and a large red mite (*Rhyncholophus pilosus*). Hymenopterous parasites serve as important checks, *Praon coloradensis* having been the most common species, and *Aphidius polygonaphis* was reared.

Control measures recommended include the use of blackleaf 40 (1:500) in the early spring against the eggs on the bark; and 6⅔ per cent kerosene emulsion or whale-oil soap (1:10) against the plant lice on the leaves when abundant in May and September. Since only the dimorphs are present during the summer, the spraying must be done before June or after September 1.

A list of 24 references to the literature is appended.

Aphis immunity of teosinte-corn hybrids, W. B. Gernert (*Science, n. ser., 46 (1917), No. 1190, pp. 390–392*).—The data here presented relate to first generation hybrid plants from seed produced by fecundating teosinte (*Euclæna mexicana*) with pollen of yellow dent corn (*Zea indentata*), which species hybridize freely. The author observed that whereas both the roots and foliage of corn plants were heavily infested with aphids, no aphis was ever discovered upon either the teosinte or hybrids nearby.

Chermesidæ in relation to British forestry, H. M. Steven (*Trans. Roy. Scot. Arbor. Soc., 31 (1917), pt. 2, pp. 131–155, pls. 4, figs. 4*).—A summary of information on this family in which particular attention is given to their life history.

The fluted scale (Icerya purchasi), E. R. Speyer (*Dept. Agr. Ceylon Leaflet 3 (1917), pp. 4, fig. 1*).—A summary of information on the cottony cushion scale in Ceylon.

Icerya purchasi in Ceylon: A warning to India, T. B. Fletcher (*Agr. Jour. India, 12 (1917), No. 4, pp. 525–531, pl. 1*).—The discovery of the cottony cushion scale in Ceylon in December, 1915, an account of which has been noted above, and its rapid spread on *Acacia* spp. and citrus, together with the possibility of its introduction into India, have led to the preparation of this account. A list of 36 titles to the literature consulted or quoted is included.

Studies on the morphology and susceptibility of the eggs of Aphis avenæ, A. pomi, and A. sorbi, A. Peterson (*Jour. Econ. Ent., 10 (1917), No. 6, pp. 556–560*).—This is a report of studies made at the New Jersey Experiment Stations.

A series of experiments conducted with various insecticides and other chemicals, briefly summarized, shows conclusively that the eggs of these three species are susceptible to various insecticides, particularly lime-sulphur and lime-sulphur combined with nicotin, and that they are also susceptible to various chemicals not generally used as insecticides. Orchard experiments with lime-sulphur

(1:9) and lime-sulphur (1:9) combined with blackleaf 40 (1:500) gave good results in killing eggs of *A. avenæ* and *A. sorbi* when the spray was applied as the buds started to swell, March 31 to April 7.

Some Florida scale insects, C. E. Wilson (*Quart. Bul. Plant Bd. Fla., 2 (1917), No. 1, pp. 2–65, figs. 70*).—Brief descriptions are here given of 86 species of Coccidæ found in Florida, together with their host plants and distribution in the State. Photographic reproductions of most of the species are included.

Control of scale insects or Coccidæ in Florida, E. W. Berger (*Quart. Bul. Plant Bd. Fla., 2 (1917), No. 1, pp. 66–81*).—A summary of information on control measures for Coccidæ in Florida.

Ocneria dispar in Britain, R. Adkin (*Proc. So. London Ent. and Nat. Hist. Soc., 1916–17, pp. 1–6*).—This paper reviews the history of the occurrence of the gipsy moth in Great Britain, where it has been introduced several times. In some unknown way its extinction has resulted, and it is significant that this and another species (*Chrysophanus dispar*) have disappeared from the fen districts, so far as has been gathered from known records, within a year or two of one another.

The life history of the okra or mallow caterpillar (Cosmophila erosa), H. L. Dozier (*Jour. Econ. Ent., 10 (1917), No. 6, pp. 536–542, pls. 2*).—This is a report of biological studies at Gainesville, Fla., of *C. erosa*, an account of which pest by Chittenden under the name Abutilon moth has been previously noted (E. S. R., 30, p. 157).

It is said to be a source of serious damage to okra, and to injure the cotton rose (*Hibiscus mutabilis*) and the flowering maple (*Abutilon striatum*) at Gainesville through attacking the leaves. Thirty-four days were found to be required for the completion of its life cycle.

The pink bollworm in Brazil, E. C. Green (*Bol. Agr. [Sao Paulo], 18. ser., No. 7 (1917), pp. 583–606, figs. 13*).—A summary of information on (*Gelechia*) *Pectinophora gossypiella*, which appeared in Brazil in 1914, and means for combating it. It now occurs over large areas in Parahiba, Rio Grande do Norte, and Ceara.

Note on the life cycle of the sugar beet webworm, H. O. Marsh (*Jour. Econ. Ent., 10 (1917), No. 6, 543, 544*).—This note supplements the author's paper on *Loxostege sticticalis*, previously noted (E. S. R., 27, p. 861).

The Indian meal moth, Plodia interpunctella, in candy and notes on its life history, W. B. Herms (*Jour. Econ. Ent., 10 (1917), No. 6, p. 563*).—The author reports the thorough infestation of chocolate-coated marshmallow candy by the larvæ of *P. interpunctella* at San Francisco, Cal. The pest requires 40 days at a temperature of from 23 to 26° C. (73.4 to 78.8° F.) to complete its life history.

A demonstration in mosquito control, C. W. Howard (*Jour. Econ. Ent., 10 (1917), No. 6, pp. 517–521*).—This is a report upon a successful antimosquito campaign conducted at Minneapolis, Minn.

A trematode parasite of anopheline mosquitoes, J. A. Sinton (*Indian Jour. Med. Research, 5 (1917), No. 1, pp. 192–194, pl. 1*).—A parasite found in *Anopheles funestus listoni*, *A. culicifacies*, and *A. stephensii* which seems to be similar to the Agamodistomum described by Martirano[1] in *A. claviger* and to a similar parasite described by Alessandrini in *A. maculipennis* (E. S. R., 23, p. 663) is here described.

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[1] Policlin., Sez. Prat., 7 (1901), No. 35, pp. 1089–1091, figs. 5.

Asphondylia websteri n. sp., E. P. FELT (*Jour. Econ. Ent., 10 (1917), No. 6, p. 562*).—A cecidomyiid which has been found to occur in an isolated area in the vicinity of Tempe, Ariz., and was previously reported to be the European species *A. miki* (E. S. R., 27, p. 161) is here described as new.

Hypoderma lineata in Netherlands, F. BAUDET (*Tijdschr. Diergeneesk., 43 (1916), No. 23, pp. 881–889, pls. 4*).—A report of observations of this warble fly in the Netherlands.

The effect of certain chemicals upon oviposition in the house fly (Musca domestica), S. E. CRUMB and S. C. LYON (*Jour. Econ. Ent., 10 (1917), No. 6, pp. 432–436, fig. 1*).—Experiments conducted by the authors during the summer of 1916 gave positive evidence that carbon dioxid was the oviposition stimulant, while a limited series of experiments with ammonia gave negative results. While the results do not agree with those of Richardson (E. S. R., 37, p. 159), a careful analysis of his experiments have led the authors to conclude that the apparent discrepancy between his results and theirs is only in the conclusions drawn.

Studies in flies.—Classification of the genus Musca and description of the Indian species, P. R. AWATI (*Indian Jour. Med. Research, 5 (1917), No. 1, pp. 160–191, pls. 10*).—A continuation of the studies previously noted (E. S. R., 37, p. 358).

The carriage of cysts of Entamœba histolytica and other intestinal protozoa and eggs of parasitic worms by house flies, with some notes on the resistance of cysts to disinfectants and other agents, C. M. WENYON and F. W. O'CONNOR (*Jour. Roy. Army Med. Corps, 28 (1917), No. 5, pp. 522–527*).—In feeding experiments with flies (Musca, Fannia, Calliphora, and Lucilia) the authors have confirmed the results of Kuenan and Swellengrebel,[1] and show that the cyst stage of *E. histolytica*, the species which causes amebic dysentery, may be ingested when infected feces are fed upon. They have also demonstrated that the larger cysts of the nonpathogenic human ameba *E. coli* and of the flagellate *Lamblia intestinalis* are ingested in a similar manner. Cysts of all three species were found in the intestine 24 hours after the last feeding on feces, but after this time they had been discharged from the intestine.

The passage of living and active Trichomonas through the flies' intestines was observed. The unaltered and living cysts commenced to be deposited in droplets of liquid feces within 20 to 30 minutes after the fly has fed on infected feces. In the droppings of 15 wild house flies captured at random were found not only the cysts of *E. histolytica*, *E. coli*, and *L. intestinalis*, but also the oöcyst of a coccidium and the eggs of various parasitic worms (*Tænia saginata, Ankylostoma duodenale, Trichocephalus trichiurus, Heterophyes heterophyes* and the comparatively enormous lateral-spined egg of Bilharzia).

Eosin tests of their viability show that while the cysts of *E. histolytica* do not survive drying they are fairly resistant if kept moist. Cresol 1:40 or 1:50 was found to destroy them.

On a new nematode, Aproctonema entomophagum n. g. and n. sp., which parasitizes a dipterous larva, D. KEILIN (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 12, pp. 399–401, figs. 6*).—This new nematode is a parasite of the larva of *Sciara pullula*.

What determines the duration of life in Metazoa? J. LOEB and J. H. NORTHROP (*Proc. Nat. Acad. Sci., 3 (1917), No. 5, pp. 382–386*).—In the authors' experiments with the pomace fly the ratio of the duration of the life of the insect to the duration of the larval, pupal, and imago stages was found to be approximately constant for all temperatures, and the same was true for the ratio of the larval to the pupal stage.

[1] Centbl. Bkt. [etc.], 1. Abt., Orig., 71 (1913), No. 5–7, pp. 378–410, pls. 2, figs. 15.

Carabidæ injurious to fruit trees, P. LESNE (*Rev. Hort.* [*Paris*], *89* (*1917*), *No. 18, pp. 283, 284, figs. 2*).—A brief summary of information on injurious carabid beetles.

The phylogeny of the Elateridæ based on larval characters, J. A. HYSLOP (*Ann. Ent. Soc. Amer., 10* (*1917*), *No. 3, pp. 241–263, figs. 9*).

Sweet potato root weevil (Cylas formicarius), W. NEWELL (*Quart. Bul. Plant Bd. Fla., 2* (*1917*), *No. 1, pp. 81–100, figs. 2*).—A summary of information on this pest, which appears to infest the entire east coast strip of territory as far north as Daytona, Volusia County.

Shot-hole borer of tea [Xyleborus fornicatus], E. R. SPEYER (*Dept. Agr. Ceylon Leaflet 4* (*1917*), *pp. 4, pl. 1*).—A popular summary of information.

Biology of the Tephrosia weevil, P. VAN DER GOOT (*Meded. Proefstat. Midden-Java, No. 26* (*1917*), *pp. 36, pls. 2, figs. 2*).—An extended account of studies of the coffee bean weevil (*Aracocerus fasciculatus*), its parasitic enemies, and control measures. This weevil is an important enemy of *Tephrosia candida* in Java.

The toxicity of molds to the honeybee and the cause of bee paralysis, G. TURESSON (*Svensk Bot. Tidskr., 11* (*1917*), *No. 1, pp. 16–38*).—Investigations of the cause of bee paralysis by the author led to the conclusion that it is due to molds which infest poorly constructed hives. This contention has been proved through feeding cultures of fungi, two of which species (*Penicillium* sp. and *P. stoloniferum*) were obtained from the intestines of dead bees and the others obtained from honeycombs.

"*Penicillium* sp., *P. stoloniferum*, and *Cladosporium herbarum* seem to have about the same degree of toxicity to bees and were all inferior in virulence to *P. conditaneum* and Mucor. . . . The climate has undoubtedly something to do with the different degrees of virulence in the molds, those of warmer climates being far more toxic than those of temperate climates. This would also explain why bee paralysis is much more prevalent and virulent in warm than in cold climates."

The injury is probably a phenol intoxication. "The symptoms of poisoning are on the whole the same irrespective of the mold employed in the feeding experiments." The action is at first a stimulating one, followed by paralysis and the death of the bees. Bees fed with pure honey as control confirmed the finding from the mold material.

The wintering of bees in Ontario, M. PETTIT (*Ontario Dept. Agr. Bul. 256* (*1917*), *pp. 24, figs. 14*).—A popular discussion of the subject in which it is shown that if properly handled bees may be wintered successfully in any part of Ontario either in cellars or outdoors.

Money in bees in Australasia, TARLTON-RAYMENT (*Melbourne and London: Whitcombe & Tombs, Ltd.,* [*1917*], *pp. XVI+293, pl. 1, figs. 100*).—A guide to beekeeping in Australasia.

Notes on Bombidæ and on the life history of Bombus auricomus, T. H. FRISON (*Ann. Ent. Soc. Amer., 10* (*1917*), *No. 3, pp. 277–286, pls. 2*).—The studies of the life history and bionomics of *B. auricomus*, here reported, were made in central Illinois, where the species does not occur very commonly. The observations of the bumblebees supplement those of Sladen, previously noted (E. S. R., 28, p. 562). The parasitism of a worker (*B. auricomus*) by a mora, Rapides Parish, La., is recorded.

Occurrence of a fungus-growing ant in Louisiana, T. H. JONES (*Jour. Econ. Ent., 10* (*1917*), *No. 6, p. 561*).—The occurrence of *Atta texana* at Glenmora, Rapids Parish, La., is recorded.

A contribution to the knowledge of the Platygasterinæ and their life history, KIEFFER (*Centbl. Bakt.* [*etc.*], *2. Abt., 46* (*1917*), *No. 24–25, pp. 547–592; abs. in Rev. Appl. Ent., Ser. A, 5* (*1917*), *No. 7, p. 319*).—This is a systematic paper with keys to the various genera and species, in which a considerable number of species reared from cecidomyiid hosts are described as new.

[New Ichneumonoidea], A. A. GIRAULT (*Psyche, 24* (*1917*), *No. 3, pp. 88–102*).—Several papers by the author are here presented, namely, The North American Species of Pachyneuron, with Three New Species (pp. 88–90); New Miscellaneous Chalcid Flies from North America (pp. 91–99); A New Species of the Genus Mymar from the Woods of Maryland with an Important Descriptive Note (pp. 99, 100); A Metallic Species of Cirrospilopsis from Maryland (p. 100); A New Species of Closterocerus from California (p. 101); and A New Genus or Subgenus of Pachyneurine Chalcid Flies (p. 102), namely, Propachyneuronia.

Records are made in the second paper (pp. 91–99) of the rearing of *Pachyneuron virginicum* Girault from viviparous females of *Aphis sorbi* on apple at Blacksburg, Va.; of *Dibrachys clisiocampæ* (Fitch) from the larva of the potato tuber worm at Pasadena, Cal.; of *Polynema bifasciatipenne varium* n. var., from the eggs of *Œcanthus* sp. in Kansas; of *Anaphoidea conotracheli* Girault from the eggs of the grape curculio in West Virginia; of *Eutelus betulæ* n. sp., from *Cecidomyia betulæ* at Albany, N. Y.; of *Aphidencyrtus aspidioti* Girault from the oyster-shell scale at Monmouth. Me.; etc.

Chalcididæ of the wild fig tree in India, Ceylon, and Java, G. GRANDI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 11* (*1917*), *pp. 183–234, figs. 20; 12* (*1917*), *pp. 3–60, figs. 22; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 8* (*1917*), *No. 4, p. 664*).—This consists of a systematic description of the chalcidids found to occur in the fruit of the fig (*Ficus* spp.).

New chalcid flies, with notes, A. A. GIRAULT (*Bul. Brooklyn Ent. Soc., 12* (*1917*), *No. 4, pp. 86–89*).—Among the seven species here described as new are *Eurydinota lividicorpus*, reared from the pistol case bearer, which occurs in several localities in California, and *Eurytoma pissodis*, reared from *Pissodes strobi* at Taylors Falls, Minn.

Eight new species of reared ichneumon flies with notes on some other species, R. A. CUSHMAN (*Proc. U. S. Nat. Mus., 53* (*1917*), *pp. 457–469*).—The species here described as new are said to have been reared by agents of the Bureau of Entomology of the U. S. Department of Agriculture, and the majority of them to be represented by a considerable series.

The new species are *Bathythrix tibialis*, probably a secondary parasite of *Ametastegia glabrata* at Wenatchee, Wash.; *Aenoplex nigrosoma*, *Caenocryptus newcomeri*, and *Chaeretymma minuta* reared from *A. glabrata* at Wenatchee, Wash.; *Spilocryptus polychrosidis* from the grape berry moth at North East, Pa.; *Scambus ephialtoides* from *Evetria siskiyouana*, at Colestin, Siskiyou, and Ashland, Oreg., Corlett, Mont., and Crescent City, Cal.; *Itoplectis obesus* from the fruit tree leaf roller and bud moth at Wenatchee, Wash.; and *Glypta evetriæ* from *Evetria taxifoliella* from Ashland, Oreg., and Missoula, Mont.

(*Tryptus*) *Microcryptus osculatus* has been reared in considerable numbers from the larvæ of *A. glabrata* at Wenatchee, Wash.; *Aenoplex plesiotypus* has been reared from the codling moth at Wenatchee, Wash., and Vienna, Va.; and *A. carpocapsæ* is recorded as having been reared from *Enarmonia caryana* at Dewitt, Ga.

Three new chalcid flies from North America, A. A. GIRAULT (*Bul. Brooklyn Ent. Soc., 12* (*1917*), *No. 4, pp. 85, 86*).—One of the species here described as

new (*Elachistus sanninoideæ*) was reared from the pupa of the peach borer at Fayetteville, Ark.

Wolfiella ruforum n. g. and n. sp., a chalcid parasite of the eggs of Lophyrus rufus in Germany, A. Krausse (*Ztschr. Forst u. Jagdw., 49 (1917), No. 1, pp. 26–35; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 4, p. 665*).—The eggs of *L. rufus* collected from pine needles were found to be highly parasitized by *W. ruforum*, here described as representing a new genus and species.

New parasite cages, C. E. Pemberton and H. F. Willard (*Jour. Econ. Ent., 10 (1917), No. 6, pp. 525–527, pl. 1*).—The authors describe improved cages made use of during the course of studies of introduced braconid parasites of the Mediterranean fruit fly in Hawaii.

The biology of Cœlinidea meromyzæ, E. O. G. Kelly (*Jour. Econ. Ent., 10 (1917), No. 6, pp. 527–531*)—This is a brief summary of information on *C. meromyzæ*, a parasite of the wheat bulb worm (*Meromyza americana*), to which there are but few references in the literature.

The author finds that this parasite oviposits in the eggs of this host, and that apparently there are two annual broods and an extra brood in case there is an extra host brood. The examination of a number of infested plants collected in 1914 and 1915 led him to conclude that the percentage of parasitism is not sufficient to have a controlling influence on the host.

The Latrodectus mactans and the Gliptocranium gasteracanthoides in the Department of Arequipa, Peru, E. Escomel (*New Orleans Med. and Surg. Jour., 70 (1917), No. 6, pp. 530–542, figs. 2*).—"The *L. mactans* and the *G. gasteracanthoides* are two dangerous arachnids that exist in southern Peru. Their bite has caused cases of arachnidism with local and general symptoms, resulting sometimes in death. The treatment with permanganate of potash, internally and externally, is the one that has given the best results."

New tick records for Minnesota, C. W. Howard (*Jour. Econ. Ent., 10 (1917), No. 6, p. 560*).—A male *Ornithodoros talaje* is recorded from Le Sueur and *Dermacentor albipictus* has become established at Itasca Park.

FOODS—HUMAN NUTRITION.

Nutrition investigations upon cottonseed meal.—III. Cottonseed flour. The nature of its growth-promoting substances, and a study in protein minimum, Anna E. Richardson and Helen S. Green (*Jour. Biol. Chem., 31 (1917), No. 2, pp. 379–388, figs. 4*).—Continuing previous work (E. S. R., 38, p. 166), this article reports feeding experiments with rats to show the content in cottonseed flour of growth-essential factors other than protein and mineral matter, and reports the results of studies of the protein minimum of cottonseed flour. The following results are summarized:

Fifty per cent of cottonseed flour in the diet contains sufficient water-soluble food accessory for normal growth, but does not contain sufficient fat-soluble food accessory for normal growth, although 12 per cent of the ether extract appears quite as efficient in supplying enough of the fat-soluble accessory for normal growth as does an equivalent amount of butter fat. Eighteen per cent of cottonseed protein when supplied with adequate amounts of all other necessary nutritive factors induces practically normal growth and reproduction in rats but with high mortality in the second generation. Twelve per cent of cottonseed protein does not induce perfectly normal growth. Normal growth has not been obtained on 9 per cent of cottonseed protein, and very little growth has been obtained with 6 per cent of this protein. With only 4

per cent of cottonseed protein rats have lost weight but later maintained weight.

How to grow the cowpea and forty ways of preparing it as a table delicacy, G. W. CARVER (*Alabama Tuskegee Sta. Bul. 35 (1917), pp. 24, figs. 5*).—This bulletin discusses the cultivation and uses of the cowpea, and gives forty tested recipes for preparing it for the table, also some remedies for its diseases and insect enemies.

The uses of the peanut on the home table, JESSIE P. RICH (*Bul. Univ. Tex., No. 1720 (1917), pp. 18, figs. 3*).—This bulletin includes a discussion of the food value of this legume and ways of preparing it for home use.

The biological efficiency of potato nitrogen, MARY S. ROSE and LENNA F. COOPER (*Jour. Biol. Chem., 30 (1917), No. 2, pp. 201–204*).—The experiments cited in this article demonstrate that the potato is a source of nitrogen compounds of high nutritive efficiency in spite of the fact that only 63 per cent of the potato nitrogen is reported to be in the form of protein.

Burned grain or flour (*Sci. Amer. Sup., 83 (1917), No. 2162, p. 367*).—Milling and baking tests with wheat and flour which had suffered from fire in a grain elevator at Mans, France, were made by E. Vidiere and indicated that exposure of the milled product to the air lessened the burnt odor. Bread made from this flour varied from good tasting to disagreeable, but, in general, was said to be of fair quality.

The wheat increased in density due to the drying effect of the fire, resulting in a proportion of 1:1.13. Five per cent of the grain was carbonized. Flour mixed with fresh bran, 50 parts of flour to 25 of bran, and left in contact for four days at 20° C., then bolted, was found to be deodorized.

Bread and bread making, NORMA J. DAVIS (*Agr. Ext. Univ. Nev. Bul. 12 (1917), pp. 15*).—This bulletin gives a short history of the use of bread and discusses the physics and chemistry and the mechanics of bread making. Instructions for making bread are taken up in a series of lessons covering both quick breads and yeast breads. Some recipes are included.

The chemistry of bread making, C. H. LAWALL (*Trans. Wagner Free Inst. Sci. Phila., 8 (1917), pp. 77–95*).—The author discusses the different types of bread and their use. The chemical changes normally occurring in bread making in the leavening of bread by mechanical aeration, by the use of chemicals, and their bacterial action as in salt-rising bread, are described. The chemical changes that arise from the use of adulterants of bread are also noted.

Making sauerkraut, A. T. ERWIN (*Iowa State Col., Agr. Ext. Dept., Emergency Leaflet 24 (1917), pp. 2*).—This leaflet gives directions for making and storing sauerkraut.

Essentials in the selection of beef, W. C. COFFEY and E. K. AUGUSTUS (*Illinois Sta. Circ. 206 (1917), pp. 16, figs. 17*).—This circular includes a description of the cuts of beef, their relative economy, and general methods of cooking.

Sanitary inspection of slaughterhouses, J. O. LABACH and W. H. SIMMONS (*Kentucky Sta. Bul. 209 (1917), pp. 137–167, fig. 1*).—The bulletin consists mainly of the text of the sanitary regulations for the killing, handling, and sale of meat and meat products in Kentucky, the results of the inspection of slaughterhouses during 1916 and 1917, and an illustrated description of Kentucky sanitary privy.

Manual of military cooking, 1916 (*Ottawa: Govt., 1916, pp. 68, figs. 24*).—This book contains information concerning the duties of the officers of the mess, gives descriptions of messing arrangements and apparatus, and includes a statement of the British Government Army ration and many recipes.

This book contains essentially the same material, with some additional figures showing the use of camp cooking devices, as that given in the British Manual of Military Cooking.[1]

New Mexico cookery, Alice S. Tipton (*Santa Fe, N. Mex.: State, Land Off., 1916, pp. 64*).—This booklet gives directions for the preparation of certain New Mexican dishes from the native food products, including the use of New Mexican chili, herbs and garlic, olive oil, hulled corn and meal, and the pinto or frijole bean.

Comparative statistics on foodstuffs and fuel for four years as shown in a budget of the annual cost of living of a family of five persons, C. H. Younger (*Olympia, Wash.: State Bur. Labor, 1917, pp. 3*).—A table showing the annual cost of foodstuffs and fuel for a family of five for the years 1914, 1915, 1916, 1917 in Seattle, Tacoma, Spokane, and the State of Washington exclusive of these large cities is given.

The rôle of vitamins in the diet, T. B. Osborne and L. B. Mendel (*Jour. Biol. Chem., 31 (1917), No. 1, pp. 149–163, figs. 4*).—This article discusses the work of Röhmann, who has taken vigorous exception to the vitamin hypothesis. The authors cite experiments to prove the necessity for at least two formerly unappreciated components of the adequate dietary. These occur in natural foods.

"Despite the success which has attended the use of yeast as an adjuvant to otherwise inadequate food mixtures, notably in the case where casein or edestin furnished the bulk of the protein, such yeast-containing 'artificial' food mixtures have not yet demonstrated a nutrient efficiency equivalent to that manifested through the use of 'protein-free milk' or certain other naturally occurring food products like cottonseed meal. The refusal of some rats to eat an adequate amount of the yeast-containing foods has proved a stumbling block to exact comparisons. Although some of the animals brought up on the yeast-containing foods have given birth to young, thus far none of the latter have been reared."

The "vitamin" hypothesis and deficiency diseases.—A study of experimental scurvy, E. V. McCollum and W. Pitz (*Jour. Biol. Chem., 31 (1917), No. 1, pp. 229–253, figs. 11*).—"The observations reported in this paper furnish definite support for the idea that scurvy in the guinea pig is not the result of the deficiency of a specific protective substance. . . . The first cause of the disease is associated with the retention of feces owing to diets of unfavorable physical character and debility of the digestive tract through stretching and contact with irritating and toxic putrefaction products of bacterial origin."

The authors provisionally adopt the view "that unfavorable proportions among the well-recognized constituents of the diet as well as of the two but recently appreciated ones, together with unsatisfactory physical factors and injury wrought through the agency of microorganisms inhabiting the alimentary tract, will account for all the observed types of pathological functioning which specific substance (water-soluble B) in the diet.

The authors agree with Funk that polyneuritis is caused by a deficiency of a specific substance (water-soluble B) in the diet.

"Since diets containing liberal amounts of butter fat (fat-soluble A) permit the development of scurvy, rickets, and polyneuritis, there would seem to be but one syndrome, pellagra, which one might possibly refer to a shortage of this second unidentified dietary factor. There is, however, not the slightest

[1] London: Govt., 1910, reprinted 1915, pp. 82, pl. 1, figs. 3.

evidence that there is any reason to attribute pellagra to this cause. Of the profound importance of proper amounts and relationships of the inorganic constituents of the diet our published results have furnished many examples. This, together with proteins of poor quality taken regularly at low planes, and an inadequate supply of fat-soluble A, has contributed to nutritive failure in all diets described by Goldberger and his associates as being employed by peoples where the incidence of pellagra is high."

A bibliography is appended.

The nutritive value of the diamino acids occurring in proteins for the maintenance of adult mice, E. M. K. Geiling (*Jour. Biol. Chem., 31 (1917), No. 1, pp. 173–199*).—The experiments reported were all conducted with adult mice for the purpose of ascertaining whether or not the diamino acids, arginin, histidin, and lysin, which are precipitated with phosphotungstic acid in acid solution, are necessary for the maintenance of adult mice. The following findings are among those summarized:

"If the diamino acids are removed from hydrolyzed casein with phosphotungstic acid in acid solution, the residual amino acids are inadequate for the maintenance of adult mice. . . . Cystin appears to be necessary for the maintenance of adult mice. Arginin and histidin seem to be interchangeable in nutrition. Full-grown mice are able to hold their weight when either of them, together with systin, is present in the ration. In the absence of both, loss of weight results. . . . Lysin does not appear to be necessary for the maintenance of adult mice."

A bibliography is appended.

Influence of protein intake on creatin excretion in children, W. Denis, J. G. Kramer, and Anna S. Minot (*Jour. Biol. Chem., 30 (1917), No. 2, pp. 189–196*).—"Experimental results are presented on four children and one infant in which it is shown that the amount of creatin found in the urine of children is directly dependent on the intake of protein, being high when large quantities of protein (creatin-free) are ingested, decreasing and in some cases disappearing entirely when the child is fed a diet of an extremely low protein content. Creatinuria in normal children is therefore due to the relatively high protein intake which is the rule with practically all children; that it may also be due to the low saturation point of immature muscle is suggested by the small creatin content of the muscles of children and by the relatively low level of protein consumption at which appreciable quantities of creatin are excreted."

Bence-Jones proteinuria.—Some observations on its occurrence, with particular reference to nephritis and hypertension, S. R. Miller and W. A. Baetjer (*Jour. Amer. Med. Assoc., 70 (1918), No. 3, pp. 137–139*).—This article reviews the investigations and theories of several workers in regard to the general subject of Bence-Jones proteinuria and cites several new cases.

"Bence-Jones protein apparently may occur in seemingly healthy young persons, in whom it may be discovered accidentally. In the cases reported, there were, in addition, hypertension and cylindruria, despite functional renal tests which were in all respects normal. These cases may be strong additional proof of the theory that Bence-Jones proteinuria is an inborn error or anomaly of metabolism. . . .

"It seems obvious that the association of Bence-Jones proteinuria, hypertension, and nephritis is probably not uncommon, and the chances are that attention called to this matter will result in the finding of more cases."

Studies in calcium and magnesium metabolism.—I–III, M. H. Givens and L. B. Mendel (*Jour. Biol. Chem., 31 (1917), No. 2, pp. 421–433, 435–439, 441–444*).—Three studies are reported.

I. *The effects of base and acid.*—"Administration of base or acid produced no significant effect upon the balance of nitrogen, calcium, magnesium, and phosphorus in the dog. Administration of hydrochloric acid increased the urinary excretion of calcium and thereby altered the relation of calcium to magnesium in the urine. The calcium contained in milk was more effective than soluble calcium lactate in producing calcium retention. Administration of large doses of alkali bicarbonate to a human diabetic did not decrease the urinary output of calcium."

II. *The effect of diets poor in calcium.*—This article gives experimental data which show that diets poor in calcium are not conductive to a positive calcium balance even when an abundance of nitrogenous food is available.

III. *The effect of fat and fatty acid derivatives.*—This article discusses the experimental feeding of dogs to show the relation of fat and fatty acid derivatives upon the utilization of calcium and magnesium. "It is evident from the data presented that poor utilization of fats or fatty acids may increase the excretion of lime in the feces and prevent the storage of calcium even when the calcium intake is comparatively abundant."

The metabolism of sulphur.—II, The influence of small accounts of cystin on the balance of nitrogen in dogs maintained on a low protein diet, H. B. Lewis (*Jour. Biol. Chem., 31 (1917), No. 2, pp. 363–377, fig. 1*).—Continuing previous work (E. S. R., 35, p. 863), experimental feedings of dogs maintained on standard diets of low protein content but of ample calorific value and given small amounts of cystin are reported. The conclusion is reached "that the addition of small amounts of cystin to the diet of dogs on a low protein diet diminished the loss of nitrogen from the body and favorably influenced the nitrogen balance. This is interpreted to be the result of a specific demand for cystin for metabolic purposes, since tyrosin and glycocoll added to the diet under like conditions of experimentation did not diminish the nitrogen loss or influence the condition of nitrogenous equilibrium."

A study of the effect of hydrochloric acid on the mineral excretion of dogs, R. L. Stehle (*Jour. Biol. Chem., 31 (1917), No. 2, pp. 461–470, figs. 6*).—The conclusions reached by this experiment are that "the administration of hydrochloric acid by mouth to the dog causes an increased excretion of calcium and magnesium, as well as of sodium and potassium, but in the case of the latter pair a compensatory retention makes the loss apparent rather than real. If an analogous condition holds in human diabetes, the resulting calcium loss may be something to take into consideration in the treatment of diabetic patients in whom the excretion of hydroxybutyric acid has reached a significant figure."

ANIMAL PRODUCTION.

The nutritive properties of kafirin, A. G. Hogan (*Jour. Biol. Chem., 33 (1918), No. 1, pp. 151–159, figs. 4*).—The author reports the results of feeding experiments with kafirin, the chemical examination of which has been previously noted (E. S. R., 37, p. 8). Rats were used as the experimental animal.

A basal diet in which kafirin formed the sole source of protein supply resulted in nutritive failure. The addition of gliadin barely sufficed for maintenance. Gelatin caused a slight growth which became more rapid with a combination of gelatin and gliadin. This led to the assumption that lysin is the first limiting factor in kafirin, the second being tyrosin, cystin, or tryptophane. To test this the amino acids mentioned were added singly and collectively to the basal rations. Experimental data confirmed the assumption that lysin is the first limiting factor and seem to show that cystin is the second.

The author states that the data bring out one fact of general application, that lysin is indispensable even for the maintenance of young animals. The literature on this subject is reviewed.

The soft corn problem, J. M. Evvard (*Iowa Sta. Circ. 40 (1917), pp. 8*).—The utilization of soft corn is a problem that confronts the Iowa farmer especially in backward seasons or in case of an early frost. This circular discusses methods of employing such corn to the greatest profit.

The silo is deemed the most satisfactory storage for soft corn. It may be ensiled, using the entire plant or only the ears. Shocking will help to save the stover, that of soft corn being of high quality. Cribbing is generally safe when the corn runs from 25 to 30 per cent of moisture. Shredding is usually unsatisfactory as the excess moisture in soft corn causes it to spoil in storage. The marketing of soft corn should be done while it is in a frozen state. Feeding soft corn is the logical disposition to make of it. Hogs and cattle can dispose of it with least danger. If moldy it is considered dangerous for horses and young sheep.

The composition, digestibility, and feeding value of pumpkins, J. B. Lindsey (*Massachusetts Sta. Bul. 174 (1917), pp. 55–71*).—In four analyses of pumpkins grown in two seasons the average water content was 87.53 per cent, crude protein 1.92, fat 1.49, fiber 1.84, extract matter 6.25, and ash 0.96 per cent. The dry matter contained more protein than roots or grain, with a portion of it in the amido form. Of nearly 18 per cent of sugar ⅓ was in the form of cane sugar. Nearly all the fat was contained in the seed.

Two digestion trials were made during successive seasons with two sheep in each case, the details to be published elsewhere. The dry matter of the pumpkin was about 81 per cent digestible, which is estimated to be about 20 per cent greater feeding value than mangels and turnips.

An experiment was made to test the value of pumpkins as a feed for dairy cows. Two cows were fed hay, bran, cottonseed meal, and hominy meal through three periods of 21 days each. In the second period 5 lbs. of the hay was replaced with 30 lbs. of the cut pumpkins, which contained 1 lb. more of digestible matter than the hay. The yield of milk was substantially the same. The total solids, evidently due to an increase in the percentage of fat in the milk, increased with the pumpkin ration. The results indicate that from 5 to 6 lbs. of pumpkins was equal in food value to 1 lb. of hay.

Prickly-pear stock feeding experiments at Wallumbilla (*Queensland Agr. Jour., n. ser., 7 (1917), No. 2, pp. 62–70, figs. 18*).—These experiments were carried out to test the value of prickly pear as a cattle feed, how to feed and the amounts, the water requirements where pear is fed, and the physiological effect of the diet.

The trials were carried on for six months with 18 young bullocks. The animals had to be gentled and taught to eat the pear, and some lost as much as 80 lbs. before becoming used to the feed. None of the animals fed exclusively on pear consumed more than 90 lbs. daily, and on the average maximum of 62 lbs. per day they obtained insufficient nutriment to maintain life for more than limited periods. With the addition of from 3 to 3.5 lbs. of lucerne chaff or from 2 to 2.5 lbs. of linseed cake to the ration the animals gained during the coldest months ⅓ lb. per day, and during warmer weather some gained ½ lb. per day and became fit for beef purposes. It was not necessary to singe the pears; passing them through a power-driven slicer made them fit to feed. Machine-sliced pear was as acceptable as boiled pear.

Two of the animals slaughtered to test the effect of an almost exclusive pear diet proved satisfactory for beef purposes and carried a light but even distribution of fat. The veterinarian's report found that with the exception of a

minor ulceration of the tongue, palate, and stomach there was no evidence of an unhealthy nature that might be attributed to the pear ration. It appeared that the mucous membranes of the digestive organs had become thickened as a result of irritation, but there were no lesions of a serious nature. There was no accumulation of fiber in the stomachs.

From the results of this experiment prickly pear seems to be a complete roughage and hay not required. During the cool weather the animals did not receive any water for 150 days, but when the warm weather set in they drank considerable quantities.

Prickly pear as cattle fodder.—Experiments in Queensland (*Pastoral Rev., 27 (1917), No. 5, p. 425*).—A brief summary of the work noted above.

Oil cakes in the feeding of animals, A. Gouin and P. Andouard (*Jour. Agr. Prat., n. ser., 29 (1916), Nos. 12, pp. 214, 215; 13, p. 228; 14, pp. 241, 242*).—This article treats of the feeding of oil cakes (peanut, coconut, sesame, and palm nut) to cattle, pigs, and horses. Where the prices will permit it may replace hay, oats, and other feeds in the usual ration. Its greater utilization is urged.

The principal place of the manufacture of oil cakes in France is Marseille, peanut cake leading. The production of peanut cake in that city runs about 300,000 tons annually, but only about 250,000 tons were produced in 1915.

Commercial feeds, J. M. Pickel and E. S. Dewar (*Bul. N. C. Dept. Agr., 37 (1916), No. 11, pp. 55, fig. 1*).—During the year 1916, 542 samples of feeds were analyzed, of which 401 were collected. Of the total number 29 per cent were below the guaranties while 14.7 per cent were substantially not so good as claimed by the manufacturer.

The feeding stuffs analyzed included wheat bran and middlings; shipstuff; red dog flour; mixed feeds with and without molasses; poultry feeds; cottonseed meal and feed; cracked corn, chop, and meal; beet pulp; calf meal; corn gluten feed; meat scrap; rice meal; peanut meal, cake, and offal; velvet bean meal; and soy bean meal.

A table of relative values of some concentrated cattle foods, O. T. Faulkner (*Jour. Dairying [India], 3 (1916), No. 2, pp. 86–91*).—Analyses, percentages of digestible nutrients, and energy values are given for the following feeds: Gram meal (*Cicer arietinum*), guar meal (*Cyamopsis psoralioides*), moth meal (*Phaseolus aconitifolius*), mash meal (*P. mungo*), mung meal (*P. radiatus*), and juar (*Andropogon sorghum*).

The equivalence of live stock foodstuffs and feeding rations, A. J. Perkins (*Jour. Dept. Agr. So. Aust., 19 (1915), Nos. 2, pp. 142–157; 3, pp. 260–266; 19 (1916), Nos. 7, pp. 620–627; 10, pp. 900–905*).—A summary of present knowledge of feeds and feeding with tables of analyses and feed values. A comparison is made of the prices of local rations with their estimated values. From prevailing conditions and supplies, rations for the various classes of live stock are proposed.

A study of the normal metabolism of the guinea pig, L. M. Smith and H. B. Lewis (*Jour. Amer. Chem. Soc., 39 (1917), No. 10, pp. 2231–2239*).—The total nitrogen, ammonia, urea, creatinin, chlorids, phosphates, hydrogen-ion concentration, and total acidity of the urine of guinea pigs on diets of carrots and cabbage were determined.

Form and function, a contribution to the history of animal morphology, E. S. Russell (*London: John Murray, 1916, pp. IX+383, figs. 15*).—This is a history of anatomy, in which the author seeks to show the continuity of animal morphology from Aristotle to the present time.

The currents of morphological thought are three—the functional or synthetic, the formal or transcendental, and the materialistic or disintegrative. "Is function the mechanical result of form, or is form merely the manifestation of function or activity?" The author is in sympathy with the functional attitude. Theories of evolution have blinded us to the questions of vital phenomena, and the opinion is hazarded that we will return to a simpler attitude toward the problems of animal form.

Embryology of the yellow mouse, W. B. KIRKHAM (*Abs. in Anat. Rec., 11 (1917), No. 6, pp. 480, 481*).—Material from nonsuckling yellow mice representing embryonic stages of each of the first 19 days of pregnancy was compared microscopically with similar material from nonsuckling white mice.

It was found that the rate of cleavage and of embryonic development is the same for yellow as for white mice. All of the observed two-cell stages of both yellow and white mice appear normal. No degenerating morulæ or blastulæ were found in white mice, while one or more were present in every yellow mouse containing embryos of that stage in development. The material covering the sixth to the seventeenth days of pregnancy yielded degenerating embryos in 8 out of 28 uteri in white mice and in 11 out of 13 yellow mice. If females that have stillbirths or that eat their new-born young are eliminated, the figures become more striking, degenerating embryos in white mice appearing in only 1 uterus out of 12 examined, while in yellow mice 11 out of 12 uteri contained them. No degenerating embryos were found in either white or yellow mice pregnant more than 16 days. [Apparently the author did not test genetically the white mice. It is possible that some of them carried the factor for yellow color.]

Evidence for the death in utero of the homozygous yellow mouse, H. L. IBSEN and E. STEIGLEDER (*Amer. Nat., 51 (1917), No. 612, pp. 740–752, fig. 1*).—Data are presented substantiating the conclusions of Castle and Little (E. S. R., 24, p. 475) and Kirkham (see above) that in mice homozygous yellow zygotes are produced in the yellow×yellow mating, but that these zygotes fail to develop normally after implantation in the uterus. In the studies here reported 688 embryos were obtained from nonsuckling females pregnant from 13 to 19 days. These embryos were from the following matings: (1) Yellow ♀×yellow ♂, (2) yellow ♀×nonyellow (chocolate) ♂, (3) nonyellow (chocolate) ♀×yellow ♂, and (4) nonyellow ♀×nonyellow ♂. In this last mating most of the parents were self-blacks.

During the investigation two types of dead embryos were encountered, (1) those in which development had ceased shortly after implantation, and (2) a few which had died after apparently normal development of about 13 days. The average number of living embryos was less for the mating yellow× yellow than for any of the other types of matings, singly or combined. In the yellow×yellow matings the average of 33 litters was only 6.15, while for 49 litters of the other matings combined the average was 7.63. The average litter size when dead embryos are also included was 8.27 for yellow×yellow and 8.47 for all other matings. Of living litters of mice born in the laboratory during the course of this investigation 140 litters from yellow× yellow averaged 5.36 each and 180 litters from nonyellow×nonyellow matings averaged 6.56 each.

In explanation of this failure of homozygous yellow zygotes to develop, it is suggested that in mice there may be a "lethal factor," similar to those so well known in Drosophila, which is so closely linked to the factor for yellow that they are practically at the same locus and there is consequently no crossing over.

The biology of twins, H. H. Newman (*Chicago: Univ. Chicago Press, 1917, pp. IX+186, pl. 1, figs. 55*).—In this book the attempt has been made to gather from various sources the facts about mammalian twins and to unify these varied situations into one point of view. A detailed account is given of the facts revealed by the study of monozygotic twinning in the armadillo, as, in the author's opinion, this is the nearest approach at present possible to the direct study of twinning in mammals, and more especially of human twinning. The phenomenon of freemartinism in cattle is reviewed and its bearings on the problems of sex biology noted. The study of twins in relation to the following problems is discussed: (1) The time of and the mechanics of sex-determination, (2) the significance of sex-ratios, (3) the mechanism of sex-differentiation, (4) the inheritance of twinning, (5) modes of inheritance in monozygotic or polyembryonic twins, and (6) the nature and significance of symmetry reversals in monozygotic twins.

A mule and a horse as twins, and the inheritance of twinning, W. R. B. Robertson (*Kans. Univ. Sci. Bul., 10 (1917), No. 15, pp. 293–298, pls. 4*).—The author presents data in reference to the birth of a female mule and a male horse as twins. The year previous to the birth of these twins their dam, just 10 minutes before being bred to a jack, had been bred to a 3-year-old stallion. It is noted that this mare in the nine times she had produced foals had given birth to twins (mules) on two other occasions. In addition one of her single mare foals had produced twins (horses), and also her own half sister had produced twins. The inheritance of color in the twin offspring of this mare is discussed. Photographs of the mare and the mule-and-horse twins are reproduced.

Some breeding statistics, R. Branford (*Agr. Jour. India, 12 (1917), No. 4, pp. 573–578*).—Brief notes are given on color inheritance in mules, asses, sheep, and cattle and sex ratios in cattle and asses. The data were obtained for the most part from breeding operations at the Government cattle farm at Hissar, India.

Receipts and shipments of live stock, 1916 (*Union Stock Yard and Transit Co. Chicago, Ann. Live Stock Rpt., 51 (1916), pp. 3–56*).—This gives the receipts and shipments of live stock at the Union Stock Yards, Chicago, for 1916, with a summary of receipts and shipments and valuations of all live stock for a term of 51 years ended December 30, 1916.

Live stock slaughtered (*Jour. Agr.* [*New Zeal.*], *15 (1917), No. 2, p. 110*).—The following stock was slaughtered in New Zealand during the year ended March 31. 1917: Cattle, 328,708; calves, 19,396; sheep, 3,341,910; lambs, 3,411,621; and swine, 153,444. This showed an increase over the previous year of 20,403 head of cattle, and a decrease of 389,733 sheep, 653,479 lambs, 14,374 calves, and 16,271 swine.

Indo-China live stock; exports to France and the Far East, C. Sarazin (*Bul. Écon. Indochine, n. ser., 19 (1916), No. 121, pp. 563–608*).—A discussion of the live-stock industry in Indo-China with statistics of exports. The needs of the industry are discussed and methods proposed whereby it may be bettered and enlarged.

Inheritance of fertility in Southdown sheep, E. N. Wentworth and J. B. Sweet (*Amer. Nat., 51 (1917), No. 611, pp. 662–682*).—The authors review the literature on inheritance of fertility in sheep and give results of a biometrical study of data obtained from flockbooks of the Southdown, Shropshire, Dorset, and Cotswold breeds.

It is concluded that "in general sheep of a high birth rank tend to produce offspring of a high birth rank. On the basis of the few data presented the

highest record of a ewe appears to be a better selection standard for high fertility than a random record.

"The frequency of multiple births in sheep varies with the breed. Physiological factors may exert a marked influence on heredity, the most important factors being the vigor of the ewe, the feeding of the ewe, the age of the ewe, the season, and the region. Apparently no relation exists between high fertility and additional mammæ.

"In pedigrees started from single births the birth rank of the sire does not affect the birth rank of the progeny; in pedigrees started from twin births the effect of high birth rank of the sire is only slightly significant (more than three times the probable error). The effect of birth rank of ewe on the birth rank of progeny is the same as that of the sire except in the case of pedigrees started from twin births, when it is slightly greater.

"No evidence for a sex linkage of fecundity factors occurs in the pedigrees tabulated, as shown by a comparison of the relative influence of progeny of the maternal granddam and the maternal grandsire. Evidence from Shropshire triplet pedigrees suggests that triplets are genetically different from twins and singles, which two are probably genetically alike."

Hereditary transmission of the "curly wool" character of caracul sheep in crosses between the caracul and Rambouillet breeds, L. ADAMETZ (*Ztschr. Induktive Abstam. u Vererbungslehre, 17 (1917), No. 3, pp. 161–202; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 6, pp. 906–908*).—In order to test the popular theory that the lock of caracul lambs is a specific product of their native habitat and to gain a better knowledge of the inheritance of the curl, crossings between caracul and Rambouillet sheep were made at the agricultural high school at Gross-Enzersdorf, Austria. The results thus far secured indicate that the caracul curl is a strictly hereditary character which is transmitted even if caracul sheep are crossed with other races of which the lambs have wool which does not curl. With regard to this character, such crossings produce characteristic Mendelian segregations. The capacity of caracul sheep to form these typical locks is, therefore, a character which is never caused by the natural conditions of the Bokhara district, but is rather a phenomenon of domestication due to a mutation.

In the F_1 some of the animals have no curls, others have curls like those of the pure-bred caracul, and there are all kinds of intermediates, indicating incomplete dominance in the formation of curls. The varying behavior of the hairs which form the curl at the different stages of the development of the fleece leads to the supposition that there is a close relationship between curly, flat-lying hair on the one hand, and curly, vertical hair and very wavy and slightly wavy hair on the other. It is clear that the shape of the lower part of the follicle can not be the cause of this varying behavior of the hairs.

A flock of sheep on the farm, R. F. MILLER (*California Sta. Circ. 184 (1917), pp. 7*).—The decrease in sheep production and the increase in wool importations into the United States has caused the inauguration of a campaign for the improvement of sheep husbandry. This circular discusses the details of sheep raising under California conditions.

Prices of sheep and wool from 1818 to 1915 (*Trans. Highland and Agr. Soc. Scot., 5. ser., 28 (1916), pp. 277–280*).—Annual prices are reported for Cheviot and Blackface sheep and for four classes of wool.

Pork production in Florida, J. M. SCOTT (*Florida Sta. Bul. 141 (1917), pp. 35–56, fig. 1*).—A revision and combination of Bulletins 113 and 131 (E. S. R., 28, p. 770; 35, p. 870).

The swine industry in New Jersey, with suggestions relative to the control of hog cholera, F. C. Minkler (*N. J. Dept. Agr. Bul. 1 (1916), pp. 48, pls. 11*).—A general treatise on hog breeding, feeding, and marketing. Hog cholera and the use of serum for its prevention is described.

Experiments with swine, 1916 (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 42 (1916), pp. 27, 28*).—Two lots of 5 pigs each were used in an experiment comparing tankage and skim milk, ground barley and wheat middlings constituting the basal ration. The tankage at $2.64 per hundredweight was found more economical than skim milk at 25 cts. per hundredweight. The pigs on tankage made an average gain per head of 94.2 lbs. in 95 days at a cost of 3.41 cts. per pound, while the skim milk lot gained 93.8 lbs. at a cost of 4.75 cts.

Two lots of 5 pigs each were used in a trial comparing wheat middlings, ground barley, and skim milk fed in the ordinary trough with the same rations used in self-feeders. In 95 days the first lot gained an average of 93.8 lbs. per head at a cost of 4.75 cts. per pound; while the latter gained 96.4 lbs. at a cost of 4.9 cts. The higher cost with the self-feeder was thought to be due to the greater waste, but this might be offset by the saving in labor over trough feeding.

Feeding work horses, C. W. McCampbell (*Kansas Sta. Circ. 62 (1917), pp. 16*).—An abridgment of Bulletin 186 (E. S. R., 29, p. 873).

The very short gestation of a mare, de Choin (*Compt. Rend. Acad. Agr. France, 1 (1915), No. 25, pp. 716, 717; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 10, pp. 1472, 1473*).—The author records observations on a mare which was served on March 19, 1915, and foaled on November 7, 1915, after only 233 days of pregnancy. The offspring, which was perfectly viable, weighed 128 lbs. and had a height to the withers of about 36 in. The only apparent incomplete part at birth was the epidermis of the feet, which grew rapidly during the first few days of the foal's life.

The position and prospects of mountain and moorland ponies, T. F. Dale (*Jour. Bath and West and South. Counties Soc., 5. ser., 11 (1916–17), pp. 112–117*).—An account of steps being taken, with suggestions for future work, toward the improvement of such ponies as the fell, Highland, New Forest, Exmoor, Dartmoor, and Welsh breeds of Great Britain.

Horse breeding in the Argentine Republic at the present day, G. Martinoli (*Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 6, pp. 819–825*).—The 1916 census of live stock shows an increase of over 33⅓ per cent in horses in the Province of Buenos Aires within the last eight years. Brief notes are given of the history of horses in Argentina, the improvement of local breeds by the use of imported stallions, and the feeding and care of horses under Argentine conditions. The lack of a profitable export market for horses has led to a continual changing of ideas in breeding, and as a consequence it is difficult to obtain homogeneous lots of any importance.

Comparative studies of half-breed or "mestizo" and native chickens, B. C. Velez (*Philippine Agr. and Forester, 5 (1916), No. 4, pp. 103–118, figs. 2*).—A comparative study was made of native chickens of the Philippines with White and Brown Leghorns and Black Orpington crosses on native stock.

For a period of 13 weeks from hatching the native chickens made an average weekly gain of 16.5 gm., while the crosses gained as follows: White Leghorn 17.72 gm., Brown Leghorn, 20.5 gm., and Black Orpington 21.66 gm.

While the number of fowls under observation were few and the results incomplete, the following conclusions are noted: The mestizo chickens were more

resistant to disease than the native. The Black Orpington cross laid more eggs than the White Leghorn cross, and the latter more than the native.

Satisfactory method of pedigreeing fowls, A. G. PHILIPS (*Rel. Poultry Jour., 24 (1918), No. 12, pp. 1107, 1108, 1174, 1175, 1176, figs. 5*).—An outline is given of the method used at the Indiana Experiment Station for pedigreeing chicks and recording breeding data. Samples of breeding records are illustrated.

Feeding for egg production, H. ATWOOD (*West Virginia Sta. Circ. 27 (1917), pp. 32*).—This circular summarizes results of experiments by various investigators on feeding for egg production. The subjects treated include the amount of feed, the composition, combination, and digestibility of various feeds and feeding methods. The rations now used at several experiment stations and colleges are given. A bibliography is appended.

Certain characteristics of hen eggs, H. ATWOOD and C. E. WEAKLEY, JR. (*West Virginia Sta. Bul. 166 (1917), pp. 3–35*).—This investigation, carried on during two years with two pens of 20 each of White Leghorn pullets, sought to correlate certain differences in the eggs laid. One pen was fed corn products with beef scrap and the other wheat products and beef scrap. Tables show in detail the record of each hen and certain physical variations in the eggs.

The results showed that the heavier the egg the heavier the yolk, but its percentage to the whole egg was less. With eggs laid in cycles—that is, one each day for two days or more until a day is missed—the first egg was usually heaviest, decreasing in total weight and weight of yolk until the cycle was broken. In general the yolk had a lessened percentage decrease.

The eggs of individual hens varied widely in total weight, weight of yolk, and average percentage of yolk to total egg.

The second year the amount of beef scrap was increased, the results indicating that a considerable amount of animal protein tends to weaken the viteline membrane. During both years the eggs and yolks of the wheat-fed fowls averaged somewhat heavier than those of the corn-fed. With the smaller amount of beef scrap in the ration the percentage of yolk was greater with the corn-fed fowls, but with the larger amount of beef scrap it was larger with the wheat-fed. During the second year the weight of eggs and yolks and the percentage of yolk were greater than the first year.

The care, sanitation, and feeding of foxes in captivity (*Canada Dept. Agr. Bul. 20 (1916), pp. 20, figs. 4*).—The great demand, especially for certain grades of pelts, has resulted in the increased production of foxes in captivity. This compilation serves to give information regarding the methods now employed by fox breeders, and to offer suggestions based partly on experience and partly on the principles involved in the breeding of similar animals.

The location of the ranch is described and plans of runs and pens given. About 2,500 sq. ft. of run should be allowed for each pair of foxes. The plant should be so constructed as to keep similar animals away on account of annoyance to the foxes and the liability of bringing in disease.

The proper feeding of foxes of different ages is detailed and an analysis of the milk of the fox given.

The fur of the silver fox is so highly prized because of its color that an effort is being made to fix this color by breeding, but as yet no definite result can be said to have been attained. It is a problem that the breeders must work out, depending upon the furriers to grade their product and to keep them in touch with the demands of fashion.

A description of parasites and diseases is given.

Rabbit and cavy culture: A complete and official standard of all rabbits and cavies, W. F. ROTH and C. T. CORNMAN (*Sellersville, Pa.: Item Publishing Co., 1916, rev. ed., pp. 134, figs. 24*).—A description of breeds and methods of breeding.

DAIRY FARMING—DAIRYING.

Influence of the age of the cow on the composition and properties of milk and milk fat, C. H. Eckles and L. S. Palmer (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 12, pp. 645–658, figs. 3*).—This paper gives data on this question taken from records of pure-bred Jersey, Holstein, and Ayrshire cows of the dairy herd of the University of Missouri. A study is also reported of the effect of old age on the composition of milk as indicated by data secured from the records of two Jersey cows and one dairy Shorthorn cow in the university herd. The records used in the study consisted of what is termed the "true average percentage" of fat for the entire lactation period of each cow. This percentage was calculated from the total milk and fat production for the period, the milk production being based on the actual amount of milk produced at each milking for the entire period, and the fat production being based on the percentage of fat in a composite sample of five days' duration taken at the middle of each month.

It is concluded that "the percentage of fat in the milk of Jersey cows attains its maximum with respect to the average for the entire lactation period during any one of the first three periods, but the chances appear to be greater that this will be attained in the second or third period rather than the first. Holstein cows almost invariably show the highest average percentage of fat for the lactation period during the first period. Ayrshire cows more frequently show a higher average lactation test during the first than during subsequent periods, but less frequently than in the case of Holstein cows.

"The variations in the average percentage of fat among the first few lactation periods are not sufficiently great to be of much practical importance, but the gradual decline in average test accumulates to a figure of considerable importance as the number of periods of lactation becomes greater. A low plane of nutrition during growth and prior to the first lactation period probably contributes materially to a decrease in the average percentage of fat for the first lactation period from that which it would be if the period of growth is supported by a more liberal plane of nutrition.

"Neither the percentage composition of the milk nor the physical and chemical constants of the milk fat of aged cows show any abnormalities attributable to old age. Butter made from the milk of a cow 19 years old and in her thirteenth lactation period was pronounced to be of excellent quality, and kept for a period of three months at a temperature of 8 to 10° C. without showing any marked deterioration."

Management of the dairy herd, R. W. Clark (*Colo. Agr. Col. Ext. Serv. Bul., 1. ser., No. 127 (1917), pp. 13, figs. 7*).—Notes are given on dairy barns, pastures, soiling crops, selection and feeding of dairy cows, raising dairy calves, and the age at which heifers should be bred, and rations are suggested for milch cows under Colorado conditions.

Factors and methods in the profitable production of sanitary milk, W. D. Nicholls (*Kentucky Sta. Bul. 206 (1917), pp. 3–44, figs. 28*).—The following articles are presented:

I. *Practical means of controlling bacterial infection of milk* (pp. 3–33).—The author discusses the bacterial and other factors in the production of sanitary milk.

II. *Experimental study of the conditions affecting the contamination of milk* (pp. 34–43).—This part of the bulletin describes experiments carried on with a view to determining the number of bacteria to which milk is subjected during the various daily operations in the dairy barn and milk room and to determine the best means of preventing bacterial contamination. The results were ob-

tained by exposing glass petri dishes containing a sterile nutrient medium in the dairy barn of the station and the adjoining milk room.

The results indicate that in a well-cleaned dairy barn very few bacteria are present in the air, but when dust is present the number is very large. "When the cows are in the barn the number of bacteria in the air is materially increased. The presence of bedding in the stable greatly increases the bacteria of the stable air. Dusty mill feeds and hay are fruitful sources of bacterial contamination. The act of brushing the cows adds myriads of bacteria to the surrounding atmosphere. Washing the cows' udders, even when apparently clean, greatly reduces the number of bacteria falling from the udder. Infection from washed udders is less than one-seventh of that from unwashed udders. The air in a pasture upon which is growing a heavy sod of grass is nearly sterile. In a dairy room having smooth walls and a concrete floor which are regularly and carefully washed the air should be practically free from bacteria."

It is suggested that "to keep down the bacterial contamination of the air in the stable where the cows are milked the room must be kept well cleaned and every effort must be made to keep down all dust. Dusty bedding must be avoided, and if bedding is used dust should be laid by sprinkling. Since cow hairs are laden with bacteria, all loose hairs should be removed from the cows by currying, in order to prevent them from falling into the milk. However, sufficient time should elapse after currying to permit the dust and bacteria to settle to the floor before milking begins. The cows' udders should be carefully washed with tepid water and a clean cloth before milking begins. Wiping the udder with a clean, damp cloth greatly reduces bacterial contamination of the milk. In feeding mill feeds and hay care should be taken to raise as little dust as possible."

A preliminary report on a series of cooperative bacterial analyses of milk, R. S. Breed, W. A. Stocking, et al. (*Jour. Dairy Sci., 1 (1917), No. 1, pp. 19–34*).—In this paper, which was read before the Laboratory Section of the American Public Health Association, at Cincinnati, October 24, 1916, a preliminary report is submitted of bacteriological analyses of milk made to determine whether the results secured in laboratories by university men trained in research methods were as irregular as those secured in the commercial and control laboratories in New York City. Bacterial analyses were made of four sets of five samples each by seven men, four working in the Cornell University laboratory at Ithaca, and three at the New York State Experiment Station. Each man used the technique he thought would give accurate results. The results are compared with those secured in New York City and already reported (E. S. R., 33, p. 767).

A second series of analyses was made on samples of three lots of high-grade milk inoculated with a culture of the colon bacillus, for the purpose of comparing results secured by the plate method, by the dilution method, and group and individual counts by the microscopic method. These counts were made by one person only.

It is concluded that "research men using technique which differs much in details may be depended upon to secure much more consistent agar plate counts from ordinary samples of market milk than laboratory assistants working rapidly and using the routine methods of analysis recommended for the purpose. Inexperienced workers are apt to make gross errors in count when using the direct microscopic method as a means of making exact counts. Experienced workers, however, secure results which compare favorably with those secured by workers who have had experience with the plating technique. The labor and time necessary in order to make relatively accurate counts by

either method is much greater than that ordinarily employed in making counts in laboratories where large numbers of routine analyses are made.

"In making comparative counts with the plate and microscopic methods, the agar plate counts will normally be larger than the counts of groups of bacteria by the microscopic method and smaller than the count of individual bacteria; but many things may change this relationship in individual cases. Among these things are inaccuracies in the counts due to exceptionally irregular distribution, the presence of dead bacteria, or of living bacteria incapable of growth on the agar used. Where a milk contains nothing but living bacteria occurring singly (or at least with only a relatively small number of groups containing two or more individuals), all of which are capable of growth on the agar used, very consistent counts can be made by either method from duplicate samples by the same or by different persons. In such cases the relation between the counts is such as to leave little doubt but that the figures obtained are remarkably accurate counts of the number of groups of bacteria in the case of both the microscopic and plate methods; or of the number of bacteria present in the case of the microscopic method."

Buttermaking on the farm, G. H. Barr (*Canada Dept. Agr., Dairy and Cold Storage Branch Bul. 53 (1917), pp. 16, figs. 11*).—Brief directions are given for making butter on the farm.

Home cheese making, V. E. Scott (*Agr. Ext. Univ. Nev. Bul. 15 (1917), pp. 8, figs. 5*).—Simple directions are given for the home manufacture of a number of common cheeses.

VETERINARY MEDICINE.

Public health and medicine, W. C. Gorgas (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vols. 9, pp. XV+714, pls. 2, figs. 35; 10, pp. XV+652, pls. 7, figs. 24*).—Among the papers here presented relating to diseases and the transmission of disease by insects mention may be made of the following: In volume 9, Insect-Borne Diseases in Pan America, by J. Guiteras (pp. 9–41) (E. S. R., 34, p. 754); Filariasis in the Americas, by A. J. Smith (pp. 49–76); Present Views in Respect to Modes and Periods of Infection in Tuberculosis, by M. P. Ravenel (pp. 85–95) (E. S. R., 35, p. 281); Carlos Finlay on the House Mosquitos of Havana, by F. Knab (pp. 107–110); and in volume 10, Concerning the Chemical Nature of the Vitamins, by R. R. Williams (pp. 39–48); Specific Parenteral Digestion and Its Relation to the Phenomena of Immunity and Anaphylaxis, by J. Bronfenbrenner (pp. 278–287); The Mechanism and Clinical Significance of Anaphylactic and Pseudoanaphylactic Skin Reactions, by J. A. Kolmer (pp. 287–304); Anaphylatoxin and the Mechanism of Anaphylaxis, by R. Weil (pp. 308–315); General Problems and Tendencies in Cancer Research, by L. Loeb (pp. 347–354); Factors in Immunity to Cancer, by J. B. Murphy and J. J. Morton (pp. 360–362); Immunity to Transplantable Neoplasms, by W. H. Woglom (pp. 362–365); Tumor Immunity, by E. E. Tyzzer (pp. 365–382); General Biology of the Protozoan Life Cycle, by G. N. Calkins (pp. 529–536); Parasitology of Certain Animals of Paraguay, by L. E. Migone (pp. 573–576); On the Inhibitory Properties of Magnesium Sulphate and Their Therapeutic Application in Tetanus, by S. J. Meltzer (pp. 607–615) (E. S. R., 35, p. 75); Observations on Tropical Parasites, by R. González-Rincones (pp. 615–618); and Antirabic Vaccination in Havana with Statistics Compared with Those of Other Nations, by J. Santos Fernández (pp. 635–637).

Practical veterinary pharmacology and therapeutics, H. J. Milks (*New York: The Macmillan Co., 1917, pp. [10]+519, pls. 3, figs. 19*).—This work is

intended for a practical text on veterinary materia medica, pharmacology, and therapeutics.

Report of the veterinary director general for the year ended March 31, 1916, F. TORRANCE (*Rpt. Vet. Dir. Gen. Canada, 1916, pp. 36, fig. 1*).—In addition to a report of the work of the year with the more important diseases of live stock and import testing, a report is given (pp. 16–18) on the phenol coefficient of disinfectants tested by the Hygienic Laboratory method, under the direction of C. H. Higgins. A detailed account of the work of the meat and canned foods division is also included.

The phenol coefficients of samples of disinfectants tested are as follows: Chlorid of lime, 11.8 and 13.3; Cooper's fluid, from 1.53 to 2.7; cresol compound, from 0.12 to 2.98; crude carbolic acid, from 0.34 to 5.56; crude carbolic acid (an emulsified product), from 0.12 to 2.63; Cooks Cofectant, 10; creolin, from 2.2 to 4.6; formaldehyde, 0.2; hycol, 4.31; izal, 4.18 to 8.6; izal, veterinary, 2.62; K. A. G., 1.4; K. K. disinfecting fluid, from 0.8 to 2.8; lime, from 3.2 to 17.6; Neko, 15.2 and 16.9; Pheneco, 15.8; pyxol, from 10.6 to 13; sand disinfectant, 0.033; sodium hypochlorite, 5; Wescol, 4.3; and zenoleum, 2.3.

[Diseases of animals in Saskatchewan], P. F. BREDT (*Ann. Rpt. Dept. Agr. Saskatchewan, 11 (1916), pp. 87–97*).—This reports on the occurrence of infectious and parasitic diseases of animals in Saskatchewan and incorporates a report by the provincial veterinarian, M. P. McClellan.

Wyoming live stock laws and regulations of the State veterinarian, 1917, A. W. FRENCH (*Cheyenne, Wyo.: State, 1917, pp. 58*).—A compilation of the Wyoming laws.

The distribution in wheat, rice, and maize grains of the substance, the deficiency of which in a diet causes polyneuritis in birds and beriberi in man, HARRIETTE CHICK and E. MARGARET HUME (*Proc. Roy. Soc. [London], Ser. B, 90 (1917), No. B 624, pp. 44–60*).—This is a report of experiments which deal with the distribution of "antineuritic" vitamins in the various constituents of wheat, maize, and rye grains.

"Wheat endosperm, after removal of the aleurone layer in the ordinary milling processes, constitutes white flour. It is deficient in this vitamin, and if used as an exclusive diet will induce polyneuritis in pigeons (or beriberi in man) in a manner identical with polished rice. In both the rice and wheat grain the antineuritic vitamin is concentrated mainly in the germ or embryo; it is also present to a less degree in the bran (pericarp and aleurone layer), probably in the aleurone layer.

"In the case of maize grain the embryo also possesses marked antineuritic properties. Here the scutellum can be separated from the 'plantlet' and separately investigated. Both these constituents of the embryo were found to contain antineuritic vitamin."

Researches on the diagnosis of pregnancy in cows, mares, and goats by the Abderhalden method, R. GIULIANI (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig., 40 (1917), No. 17–18, pp. 494–528*).—Previous literature on the subject of the pregnancy test as applied to domestic animals is reviewed, and investigations reported on the value of the test, particularly in connection with artificial fertilization as described by Pirocchi (E. S. R., 33, p. 71). The dialyzation method was carefully followed according to the Abderhalden technique. From the results of the experiments recorded the author draws the following conclusions:

(1) The methods can be relied upon in the majority of cases provided that the technique of Aberhalden (E. S. R., 32, p. 270) be followed scrupulously, that control tests be made with serum alone and with inactive serum and

placenta, and that in doubtful cases a second and third test be made. (2) The specific proteolytic ferments can be detected in the blood from the sixteenth to the nineteenth day after conception; that is, a diagnosis of pregnancy can be made about the end of the third week. (3) The ferments seem to remain in the blood for a period of 15 to 20 days after parturition, a fact which must be taken into consideration to avoid errors in the application of the method.

The catalase content of Ascaris suum, with a suggestion as to its rôle in protecting parasites against the digestive enzyms of their hosts, T. B. Magath (*Jour. Biol. Chem., 33 (1918), No. 3, pp. 395–400, fig. 1*).—The amount and distribution of catalase in the body of the common Ascaris, a roundworm from the hog, were determined with a view to testing the validity of the theory advanced by Burge (E. S. R., 33, p. 478) that the presence of oxidative processes in the intestinal parasites protects them from digestion. The method used was one adapted from ordinary gas analysis. The material was washed with a 75 per cent sodium chlorid solution and finely chopped up, weighed in a crucible, and introduced into a bottle containing 25 cc. of one-half diluted commercial hydrogen peroxid. This was connected with a water-filled burette with a leveling bulb. After bringing the water to the zero level, connection was made with the bottle containing the hydrogen peroxid, the action started by upsetting the crucible in the hydrogen peroxid, and after 10 minutes the water in the leveling bulb brought to the level of the water in the burette and the reading made.

Determinations were made of the catalase content of the whole worm, the body wall, body fluid, and visceral organs with the following results: "There is five-eighths as much catalase in the body wall of *A. suum* as in the visceral organs, and one-fourth as much in the body fluid as in the visceral organs. There is three times more catalase in the body wall of *A. suum* than in the leg muscles of *Rana pipiens*, if one uses the amount of the catalase in the reproductive organs of each form as the units of measurement. On the basis of this last statement it can be assumed that there is more than enough catalase in the body wall of this parasitic worm for its metabolic and locomotory functions, and hence it is possible that this excess is used to liberate oxygen for protecting the parasite against the digestive enzyms of its host, if Burge's theory be true."

Researches on the serum of the sea eel, W. Kopaczewski (*Compt. Rend. Acad. Sci.* [*Paris*], *164* (*1917*), *No. 25, pp. 963, 964; 165* (*1917*), *Nos. 18, pp. 600–602; 21, pp. 725–727*).—Three papers are presented.

I. *The toxicity of the serum.*—The serum of the sea eel was shown to be exceedingly toxic when injected intravenously into guinea pigs, rabbits, and dogs. The rapidity of the intoxication and the picture on autopsy resemble, to a certain extent, anaphylactic shock.

II. *The toxicity and physical properties of the serum.*—Studies of the effect of the various factors on the toxicity of the serum showed that the toxicity is not destroyed by keeping the serum in the dark even for as long a period as 30 days, by freezing, by absorption in animal charcoal or kaolin, and by drying, but is destroyed by sunlight and by heating to 75° C.

III. *Molecular equilibrium and toxicity of the serum.*—In connection with the study of the effect of physical agents on the toxicity of the serum, noted above, the serum was examined under the ultramicroscope. It was found that wherever the serum is inactivated profound changes take place in its ultramicroscopic structure. The particles previously separated and in an active Brownian movement arrange themselves in groups and become stationary. When the serum is mixed with that of an experimental animal an ultramicroscopic precipitation takes place. By modifying the surface tension of the serum

by the addition of cholesterol or sodium oleate the appearance of the agglomerations can be hastened or retarded, and simultaneously the disappearance of the toxicity of the serum hastened or retarded.

Experiments in the differentiation of blood and muscular albumin by precipitation and anaphylaxis, C. Lopez (*Amer. Jour. Vet. Med., 12 (1917), No. 12, pp. 853–857*).—The processes at present employed for obtaining serums for the differentiation of the albumin of blood serums are reviewed, and the following conclusions are drawn from the author's investigations of possible methods:

(1) To obtain precipitating serums for blood albumin, the best method is that of intravenous injections of 20 cc. each of horse serum into rabbits weighing at least 3 kg. (2) For the differentiation of albumin of the muscles, the best and most easily obtained and preserved antigen is that obtained by adding sodium chlorid to minced meat and dialyzing the juice through parchment paper.

When a greatly accentuated degree of specificity is required, as in dealing with meats denaturalized by heat, the author has found anaphylaxis reactions superior to precipitins for the differentiation of albumin.

A new enzym of the leucocytes of blood and of pus, lipoidase, N. Fiessinger and R. Clogne (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 21, pp. 730–732; abs. in Chem. Abs., 12 (1918), No. 7, p. 705*).—The authors have demonstrated that the leucocytes of the blood and acute suppurations have the power of secreting an enzym (lipoidase) which hydrolyzes lecithin. The enzym is destroyed by heating to from 56 to 60° C. for 30 minutes. It does not act in strongly acid or alkaline solutions but preferably in a slightly alkaline medium. The action is inhibited by formalin, by red corpuscles in large quantities, and probably by normal serum. The enzym has been identified in normal leucocytes of the blood of man, the dog, and the cat, and in aseptic and septic abscesses. It is present in polynuclear cells and absent in the lymphocytes of certain chronic effusions, as in pleurisy. This lipoidase can be distinguished from the leucocytic lipase by its greater thermostability.

Studies of the blood fat and lipoids of the dog before and after the production of experimental anemia, H. Dubin (*Jour. Biol. Chem., 33 (1918), No. 3, p. 377*).—By the use of the nephelometric and colorimetric methods of Bloor (E. S. R., 34, p. 563; 35 pp. 13, 166), blood fats have been estimated in a dog before and after infection with *Trypanosoma equiperdum*. The results show that in trypanosome anemia the total fats are increased while the lecithin and cholesterol are decreased. These results are in agreement with the reports of Bloor (E. S. R., 36, p. 365) in pernicious anemia associated with carcinoma of the stomach.

Immunity and tissue transplantation.—I, The reactions occurring about tissue transplanted into heterologous animals, M. S. Fleisher (*Jour. Med. Research, 37 (1918), No. 3, pp. 483–497*).—The experiments reported were carried out in normal and immune rabbits into which pieces of guinea-pig kidney were transplanted. The rabbits were immunized by repeated intraperitoneal injections of sterile emulsions of kidney cells. In both the normal and immunized rabbits pieces of guinea-pig kidney removed from the living animal were immediately transplanted under aseptic precautions into subcutaneous pockets on the abdomen of the rabbit. The pieces were removed and examined at various intervals up to 28 days. The examination showed the following general differences between the pieces in normal and in immunized animals:

"Kidney of guinea pigs transplanted into normal rabbits remains alive and shows regeneration even at 28 days. No regeneration takes place in immune animals. Leucocytes collect in larger numbers about the transplanted tissues

in immune animals than in normal animals. The leucocytes do not, however, penetrate the tissue as rapidly in the immune animals. The connective tissue formation in normal rabbits is more rapid and more marked than in immune animals. The penetration of the pieces in normal animals by connective tissue cells is also more rapid."

The significance of the difference between the reactions in normal and immune animals has not yet been determined.

Is there any quantitative relationship between antigen dose and antibody production? E. T. H. Tsen (*Jour. Med. Research, 37 (1918), No. 3, pp. 381–390, figs. 2*).—The question was investigated by intravenous injections of different doses of sheep serum into rabbits and subcutaneous injections of different doses of antityphoid vaccine into medical students. Examination was made of the precipitin and agglutinin productions, respectively.

The results seem to show that there is no quantitative relationship between the antigen dose and antibody production. As much antibody can be produced in response to the injection of small as to that of large doses of antigen. Moreover, large doses of antigen are at times harmful through injury to the cells, so that the animal either dies of intoxication or remains in a state of lowered resistance with the production of little or no antibody.

A comparison of the slow and rapid methods of antibody production confirmed the results of Gay and Fitzgerald, previously noted (E. S. R., 29, p. 581), that the rapid method is as efficient as the slow method.

An experimental investigation of lipovaccines.—A preliminary note, E. R. Whitmore, E. A. Fennel, and W. F. Petersen (*Jour. Amer. Med. Assoc., 70 (1918), No. 7, pp. 427–431, fig. 1*).—The preparation and methods of preservation and administration of lipovaccines from typhoid, paratyphoid, pneumococcus, meningococcus, and dysentery organisms are described with experimental data. Although considering the work as purely preliminary, the authors feel that the lipovaccine offers a number of advantages over the aqueous preparation, including "the diminution of both the local and the systemic reaction, the feasibility of giving sufficient vaccine at a single injection properly to immunize the individual, the persistence in the individual of a focus from which the immunization proceeds over a period of several months with a resulting lengthening of the period of immunity, the actual detoxicating effects of certain lipoids that can be incorporated in the vaccine, and the prevention of autolysis and deterioration of the vaccine."

The effect of high pressures on bacteria, W. P. Larson, T. B. Hartzell, and H. S. Diehl (*Jour. Infect. Diseases, 22 (1918), No. 3, pp. 271–279*).—This article reports the results of attempts to obtain the antigenic principle of bacteria in a diffused state in order to make it less accessible to the phagocytes and consequently capable of producing a higher degree of immunity than is ordinarily possible with bacterial antigens.

It was found that a direct pressure of 6,000 atmospheres kills nonspore-forming bacteria in 14 hours. A pressure of 12,000 atmospheres for the same length of time is required to kill spores. Attempts to discover the mechanism of the destruction of bacteria in this way resulted in the conclusion that the factor which destroyed the organisms was the sudden change in the osmotic tension of the fluid in which the bacteria were suspended.

Filtrate of typhoid bacteria subjected to a direct load of 6,000 atmospheres for 14 hours was found to be superior to the living culture as an immunizing antigen. Bacteria killed by carbon dioxid were found to be excellent antigens.

Identity of the toxins of different strains of Bacillus welchii and factors influencing their production in vitro, C. G. Bull and Ida W. Pritchett

(*Jour. Expt. Med., 26* (*1917*), *No. 6, pp. 867–883, figs. 10; abs. in Chem. Abs., 12* (*1918*), *No. 1, p. 51*).—Continuing previous studies (E. S. R., 38, p. 379) by investigating 22 additional strains of *B. welchii* for toxin production and antitoxin treatment, the authors have found that "the antitoxin for *B. welchii* toxin can apparently be prepared from a single strain of the organism which yields under the conditions described a high titer of toxin, and this antitoxin can be employed to combat infection with or prevent infection by any strain whatever of the bacillus."

Experiments to determine the effect of fresh muscle and glucose on toxin production and the relation of acidity to toxicity in the filtrates have shown that (1) fresh muscle increases the potency of the toxin fivefold while autoclaved muscle has little effect; (2) the addition of 0.2 to 1 per cent glucose to beef infusion broth gives a more potent product than sugar-free broth, while higher percentages lower the toxin production; and (3) there is no direct relation between acidity and toxicity.

Bacterium pyogenes and its relation to suppurative lesions in animals, A. R. Ward (*Jour. Bact., 2* (*1917*), *No. 6, pp. 619–628*).—Substantially noted from another source (E. S. R., 37, p. 276).

The use of commercial Javelle water in the treatment of infected wounds, Cazin and Miss S. Krongold (*Compt. Rend. Acad. Sci.* [*Paris*], *165* (*1917*), *No. 17, pp. 569–572*).—From the results of 510 cases of wounds treated with a solution of Javelle water (15 parts to 1,000) and from the action on fragments of skin of this solution as compared with the Dakin-Daufresne hypochlorite solution, the authors state that at the above concentration, containing 0.427 gm. of hypochlorite per liter, the Javelle water is more germicidal and less irritating than Dakin's solution.

On the treatment of war wounds by the combined action of visible and ultra-violet radiations, C. Benoit and A. Helbronner (*Compt. Rend. Acad. Sci.* [*Paris*], *165* (*1917*), *No. 17, pp. 572–574*).—Experiments extending over two years on the use of the Cooper-Hewitt mercury lamp for treating war wounds are reported. These include the treatment of atonic and ulcerated wounds, recent wounds over a larger surface, and closed and open fractures.

A new method of general chemotherapy-oxidotherapy, Belin (*Compt. Rend. Acad. Sci.* [*Paris*], *165* (*1917*), *No. 26, pp. 1074–1076; abs. in Chem. Abs., 12* (*1918*), *No. 7, pp. 722, 723*).—Clinical cases are cited in which injections of potassium permanganate of different strengths have been successfully used in the treatment of tetanus, typhoid fever, etc. Earlier experimental work[1] has demonstrated the favorable effect on certain infectious maladies of the injection of oxidizing substances.

The theory advanced by the author is that by oxidation the toxins are rendered inactive, thereby permitting the organism to combat more successfully with the microorganisms themselves. "Antitoxic therapy based on oxidation, therefore, would seem to be as indispensable as antimicrobic therapy in promoting phagocytosis." As possible therapeutic agents, the author cites potassium permanganate, sodium chlorate, sodium persulphate, ozone, colloidal metals, and pinene.

The restraining influence of cyanid upon oxidation in arsenical dips, A. G. Holborow (*Rhodesia Agr. Jour., 14* (*1917*), *No. 6, pp. 733–737*).—The article reports the results of investigations into the cause of the oxidation of sodium

[1] Compt. Rend. Acad. Sci. [Paris], 156 (1913), Nos. 16, pp. 1260–1262; 24 pp. 1848, 1849; 158 (1914), No. 13, pp. 966–968; Bul. Soc. Cent. Méd Vét., 92 (1916), No. 14, pp. 203–209; 93 (1917), No. 12, pp. 244–248.

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arsenite in dipping fluids used for tick killing. The arsenate thus formed has only about one-half the tick-killing power of the arsenite.

To determine whether the oxidation is the result of microorganisms, action on dipping fluids of various strong disinfectants was tested. Oxidation was not completely arrested by 2.5 per cent formalin, 5 per cent corrosive sublimate, 0.5 per cent carbolic acid, and 2 per cent boric acid, which would seem to prove that the oxidation is not wholly due to microorganisms. Sterilization in an autoclave, boiling for half an hour, and passing the original dipping fluid through a candle filter also failed to arrest oxidation completely. Small amounts of potassium cyanid proved most effective. The retarding influence on oxidation remained constant until 0.005 per cent was reached; below this, oxidation increased as the amount of cyanid was decreased.

Further investigations are to be reported later.

The relationship between contagious pustular stomatitis of the horse, equine variola (horsepox of Jenner) and vaccinia (cowpox of Jenner), D. A. de Jong (*Folia Microbiol. [Delft], 4 (1916), No. 3, pp. 239–266, pls. 5; Jour. Compar. Path. and Ther., 30 (1917), No. 3, pp. 242–262, figs. 5; abs. in Trop. Vet. Bul., 5 (1917), No. 3, pp. 200–202*).—The equine affections described under the above names are first critically reviewed and reference made to outbreaks in various countries. A detailed description of the symptoms manifested in outbreaks of pustular stomatitis at garrisons near The Hague follows.

Numerous experiments in the transmission of contagious pustular stomatitis of horses to healthy horses and also to calves, rabbits, etc., are reported upon. The conclusions are as follows: "In the observed cases of contagious pustular stomatitis of the horse there was an eruption in the mouth and on the skin. In the experiments material collected from the mouths of the animals attacked proved capable of transmitting the disease, including cutaneous eruptions. This material, after it had been passed through Chamberland B and F filters, still possessed the same infective quality. The ordinary vaccine, propagated in the usual manner, was equally capable of giving the horse pustular stomatitis, including cutaneous eruptions. The horse which had contracted the stomatitis spontaneously was refractory to inoculation with vaccine. Two different strains of the virus of contagious pustular stomatitis of the horse behaved like vaccine when inoculated to the calf and to the rabbit, and in the latter Guarnieri's corpuscles were present in the inoculated cornea. Besides, the complement test furnished corroborative evidence in support of this view.

"The vaccine obtained by inoculating with the virus of contagious pustular stomatitis of the horse could be propagated in animals with the same regularity as the ordinary vaccine. This vaccine derived from the horse gave excellent vaccinal pustules when inoculated into children. The revaccinated subjects presented only a reaction of revaccination. The rabbits which had been inoculated with ordinary vaccine and had shown a markedly positive reaction after recovery and revaccination with the virus of stomatitis showed only a precocious allergic (von Pirquet) reaction, whereas the control animals showed a characteristic reaction.

"We have proved that contagious pustular stomatitis of the horse is actually the most frequent form of Jenner's horsepox, and that the virus of this stomatitis passes through Chamberland B and F filters. This fact was not previously known."

Anthrax. A case of Bacillus anthracis septicemia with recovery, R. R. Graham and H. K. Detweiler (*Jour. Amer. Med. Assoc., 70 (1918), No. 10, pp. 671, 672, figs. 2*).—The authors report the successful treatment of a case of anthrax in man in which the organisms were demonstrable in the circulating blood despite local excision and subcutaneous injection of serum. Intravenous

injection of 100 cc. of chloramin-T (Dakin) and 80 cc. of antianthrax serum was followed by a rapid lowering of pulse and temperature with eventual recovery.

Studies in blackleg immunization with special reference to blackleg filtrate, A. Eichhorn (*Jour. Amer. Vet. Med. Assoc., 52 (1918), No. 6, pp. 653–669*).—This has been essentially noted from another source (E. S. R., 37, p. 689). Attention is called to the resemblance between the bacillus of blackleg and *B. welchii* morphologically, biologically, and in cultural characteristics.

Epizootic lymphangitis; some treatments, Frans (*Bul. Soc. Cent. Méd. Vét., 93 (1917), No. 24, pp. 527–533, fig. 1*).—The following treatments are discussed: (1) Local—cauterization, and Vincent's powder (boric acid and calcium chlorid); (2) general—arsenic acid, Lugol's solution of iodin and potassium iodid, sodium cacodylate, mercuric biniodid, and mercuric benzoate; and (3) serum therapy.

Treatment of epizootic lymphangitis by means of the extract of autolyzed yeast, M. Nicolle, Fayet, and Truche (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 27, pp. 1114, 1115*).—An application of antigen therapy in the treatment of epizootic lymphangitis in horses is described. The agent employed is the filtered extract of brewers' yeast autolyzed for 24 hours at 37° C. in the vapor of chloroform. To this is added 5 per cent of phenol. Successful results obtained by the authors in the treatment of six horses are reported.

The proposed technique is to make a preliminary subcutaneous injection of 2 cc. of the liquid, followed after from four to eight days by 5 cc. and eight days later by 10 cc. The latter dose may be repeated once or twice if necessary. The name "rivoltine" is suggested for the preparation.

Treatment of epizootic and ulcerous lymphangitis by autopyotherapy, Belin (*Bul. Soc. Cent. Méd. Vét., 93 (1917), No. 18, pp. 346–362*).—The author describes two methods of preparing pyovaccine from the pus of the diseased animal, discusses the general manifestations of the vaccination from observations of 15 cases, and interprets the results obtained.

The pus obtained from a ripe abscess is sterilized by ether or by heating at 70° C. for an hour in six or seven volumes of boiled water. The ether sterilization is preferred by the author.

After inoculation the animal passes through a negative phase of hypersensibility marked by an increase in the acuteness of the symptoms. This is followed by a positive phase characterized by a diminution of the symptoms and general recovery. Lymphangitis can be cured by autopyotherapy alone, but the treatment does not preclude the use of chemotherapy. The importance is emphasized of using small doses of the vaccine at first and of using pus from the animal itself, that is autopyotherapy and not simply pyotherapy.

A complementary note relative to the preparation of the pyovaccine employed in the treatment of epizootic and ulcerous lymphangitis, Belin (*Bul. Soc. Cent. Méd. Vét., 93 (1917), No. 22, pp. 462–465*).—Additional directions are given for the preparation of pyovaccine by sterilization with ether.

Pyotherapy of epizootic lymphangitis, Velu (*Bul. Soc. Cent. Méd. Vét., 93 (1917), No. 22, pp. 452–456*).—This article gives detailed instruction relative to the treatment of epizootic lymphangitis by pyotherapy.

The preparation of pyovaccine for epizootic lymphangitis, H. Velu (*Bul. Soc. Path. Exot., 11 (1918), No. 1. pp. 10, 11*).—The author distinguishes between the "polyvalent" pyovaccine obtained from open lesions in epizootic lymphangitis, and capable of acting on the cryptococci and associated organisms, and the polyethnical anticryptococcic vaccine prepared from products of new lesions or closed abscesses of different animals having epizootic lymphangitis. The latter vaccine contains only the cryptococcus from various sources.

The technique of the preparation of the polyvalent antipyogenic vaccine is described in detail. This can be used not only in the treatment of epizootic lymphangitis but also in that of various pyogenic lesions in the horse.

Some typical cases of treatment of epizootic lymphangitis by pyotherapy, Velu (*Bul. Soc. Cent. Méd. Vét., 93 (1917), No. 24, pp. 511–524*).—Several cases are described.

Leucocytotherapy or aseptic pyotherapy, its use in certain lymphangites of the horse, J. Bridré (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 27, pp. 1121–1123; abs. in Rev. Gén. Méd. Vét., 27 (1918), No. 313, pp. 29, 30; Chem. Abs., 12 (1918), No. 6, p. 593*).—The nonspecificity of cryptococcic pyovaccine and the efficacy in ulcerous lymphangites of a pyovaccine very poor in microorganisms suggested to the author that the vaccines owed their efficacy not to the specific microbes which they contained but to leucocytes or leucocytic débris and the products derived from them, and that, consequently, the same satisfactory results will be obtained by the injection of an aseptic pus such as is found in a fixation abscess. To test this theory, horses with epizootic and ulcerous lymphangitis were injected with a dilution of pus obtained from a fixation abscess previously produced by subcutaneous injection of essence of turpentine. The liquid was quickly absorbed and generally no trace of the injection was left.

The second treatment was in all cases followed by a very rapid cure, thus confirming the author's theory. "Aseptic pyotherapy can be employed advantageously in equine lymphangitis and in diseases where pyovaccines have already been satisfactory. It is possible that it is susceptible of a more general application."

Some considerations on the efficacy and absolute nonspecificity of anticryptococcic pyotherapy in the horse, H. Velu (*Bul. Soc. Path. Exot., 11 (1918), No. 1, pp. 12–17*).—Cases are cited from which the conclusion is drawn that polyvalent nonspecific pyotherapy is a simple economical method which by the results already obtained should occupy a position of the first order in therapeutic veterinary practice.

The necessity of carbon dioxid for the growth of Bacillus tuberculosis, W. B. Wherry and D. M. Ervin (*Jour. Infect. Diseases, 22 (1918), No. 3, pp. 194–197, fig. 1*).—Tests on culture media showing the effect of different carbon dioxid pressures on the growth of *B. tuberculosis* are reported. The necessity of carbon dioxid and of a supply of free oxygen for growth of the organism on artificial media is shown. The optimum requirements have not yet been determined.

An investigation of strains of tubercle bacilli from animal tuberculosis, A. S. Griffith (*Jour. Path. and Bact., 21 (1917), No. 3, pp. 329–343*).—The investigations here reported relate to the types of tubercle bacilli from naturally acquired tuberculosis in the monkey, cat, goat, bovine, and bird; the cultural characteristics of bovine tubercle bacilli; and human tubercle bacilli in the milk of a vaccinated heifer.

Infectious abortion in cows, K. Büchli (*Meded. Rijksseruminricht., 1 (1917), No. 3–4, pp. 121–205, figs. 2*).—The author has reviewed the literature on this disease including the history, etiology, biology, and course of the disease; symptoms and diagnosis; abortin and its application; agglutination and complement fixation; active and passive immunity; methods of combating the disease; and veterinary laws for controlling it. A bibliography of 68 titles is appended.

Mixed bacterial diseases of swine with differential diagnosis, J. D. Reardon (*Amer. Jour. Vet. Med., 13 (1918), No. 2, pp. 57–61*).—The author discusses

under the term "mixed infections of swine" various pulmonary diseases such as chronic bronchitis, pulmonary edema, and catarrhal pneumonia, and also diseases classified as necrobacillosis caused by *Bacillus necrophorus* and its associate organisms. He asserts that chronic hog cholera does not exist, but that the lowered resistance of the animal after an attack of cholera makes possible an invasion by the organisms of the mixed infection group.

The serum treatment of hog cholera, R. GRAHAM (*Illinois Sta. Circ. 207* (*1917*), *pp. 3–11, figs. 3*).—This is a popular summary of information.

Fagopyrismus (buckwheat poisoning) and similar affections, E. A. BRUCE (*Jour. Amer. Vet. Med. Assoc., 52* (*1917*), *No. 2, pp. 189–194*).—An outbreak of buckwheat poisoning in pigs at the University of British Columbia first recorded is followed by accounts of similar conditions produced by alfalfa, clover, St. John's wort, and knotweed. The toxic properties claimed for the knotweeds (*Polygonum* spp.) have not been substantiated by experiments made at Agassiz.

The poisoning of horses by the common bracken (Pteris aquilina), S. HADWEN and E. A. BRUCE (*Canada Dept. Agr., Health Anim. Branch Bul. 26* (*1917*), *pp. 15, figs. 5*).—This is a report of investigations and experiments with *P. aquilina* in British Columbia of which a summary has been previously noted from another source (E. S. R., 37, p. 182).

Feeding experiments with five horses reported indicate that the addition to the daily diet of about 6 lbs. of dried bracken will kill a horse in about one month.

RURAL ENGINEERING.

Operation and maintenance of irrigation systems, S. T. HARDING (*New York: McGraw-Hill Book Co., Inc., 1917, pp. XII+271, pls. 12, figs. 28*).—The purpose of this volume is apparently to cover the practical principles of the operation and maintenance of irrigation systems and to illustrate them by typical examples of their local application. No attempt is made to cover practice outside of the United States.

The opening chapters deal with general maintenance, including damages for failure to maintain and maintenance of canals, and maintenance of structures and serviceable life of irrigation structures. Other chapters deal with organization for operation and maintenance, methods of delivering irrigation water, measurement of irrigation water, irrigation rules and regulations, payment for construction and operation charges, general operation, and operation and maintenance accounts. An appendix gives rules and regulations for several irrigation districts and water companies.

Irrigating flume built with the cement gun (*Engin. News-Rec., 79* (*1917*), *No. 10, pp. 449–451, figs. 4*).—This is a brief description of the construction of a self-supporting flume with 2-in. reinforced walls built upon inside forms.

It was found that 130 linear feet could be constructed per 8-hour shift. The cement gun was found to operate most economically when within 50 ft. of the point of application. The mixture used consisted of one part cement plus 10 per cent hydrated lime and 4.5 parts of coarse sand. In shooting the walls it was found that the rebound material amounted to about 10 per cent of the material adhering to the forms.

Pumping plants of the U. S. Reclamation Service, S. T. HARDING (*Jour. Electricity, 39* (*1917*), *No. 3, pp. 108–110, figs. 4*).—This article gives data on comparative costs of raising 1 acre-ft. of water through a height of 1 ft.,

compiled from the records of the U. S. Reclamation Service. Records for 1915–16 service are given in the following table:

Operation records of irrigation pumping plants of the U. S. Reclamation Service for 1915–16.

Plant.	Type of plant.	Capacity of prime movers.	Head pumped against.	Kilowatt hours used per foot acre-foot.	Seasonal plant efficiency.	Cost of operation per foot acre-foot.	Interest on first cost of plant at 6 per cent per foot acre-foot.	Total cost per foot acre-foot.
		Horsepower.	*Feet.*		*Per cent.*	*Cents.*	*Cents.*	*Cents.*
Salt River Project:								
Battery A	Vertical motor-driven centrifugal pumps	75	49.0	1.85	55.5	3.9	3.2	7.1
B		75	46.2	1.70	60.2	2.6	1.5	4.1
C		75	48.4	1.59	64.5	2.1	1.1	3.2
D		75	46.5	1.50	68.3	2.1	1.1	3.2
E		75	44.5	1.65	62.1	2.6	1.5	4.1
F		75	32.0	2.28	45.0	3.7	2.1	5.8
McQueen well	Horizontal motor-driven centrifugal pumps	75	40.0	2.25	45.6	2.2	3.8	6.0
Clemons		100	31.3	2.56	40.1	3.1	.8	3.9
San Francisco		100	30.0	2.60	39.5	11.8	11.3	23.1
High line		450	43.0	1.40	73.2	1.3	.2	1.5
Minidoka Project:								
First lift	Vertical motor-driven centrifugal pumps	2,760	29.1	1.58	65.0	....	.2	1.0
Second lift		2,400	30 3	....	....	.8	.2	1.0
				1.73	59.3	....	....	....
Third lift		1,560	29.9	....	....	....	.2	1.0
West End	Horizontal motor-driven centrifugal	150	20.8	2.42	42.4	1.4	.8	2.2
1812 Station		5	3.8	3.90	26.3	11.0	6.8	17.8
A 4 Station	Scoop wheel	25	2.9	3.39	30.3	3.7	3.4	7.1
Huntley Project:								
Balantine	Vertical turbine-driven centrifugal	596	46.3	....	....	.1	1.4	1.5
Yakima Project:								
Snipes Mount	Vertical turbine-driven centrifugal	500	197.0	....	....	.6	.6	1.2
Hillcrest		35	103.3	....	....	.3	1.9	2.2
Yuma:								
Reservation drainage	Gas engine-driven centrifugal	110	5 to 6	....	....	10.6	2.6	13.2
Yuma Valley		40	4.0	....	....	23.2	1.8	25.0

A method of determining storm-water run-off, C. B. BUERGER (*Trans. Amer. Soc. Civ. Engin., 78 (1915), pp. 1139–1205, pls. 2, figs. 9*).—The author develops a formula for storm-water run-off of the form $q+Nq^{4/5}=P$, in which q is the run-off in cubic feet per second per acre and N and P are functions of the variable elements of topography, rainfall, etc. Diagrams are given which afford a ready means of obtaining results from the formula.

Daily river stages at river gauge stations on the principal rivers of the United States, 1915 and 1916, A. J. HENRY (*U. S. Dept. Agr., Weather Bur., Daily River Stages, 13 (1915), pp. 176; 14 (1916), pp. 278*).—These are the thirteenth and fourteenth parts of the series of river gauge readings maintained by the Weather Bureau.

Surface water supply of St. Lawrence River Basin, 1916 (*U. S. Geol. Survey, Water-Supply Paper 434 (1917), pp. 130+XXXII, pls. 3*).—This report, prepared in cooperation with the States of Minnesota, Wisconsin, New York, and Vermont, presents the results of measurements of flow made on streams tributary to Lakes Michigan, Huron, Erie, Ontario, and Superior, and to the St. Lawrence River, during 1916, together with the usual list of gauging stations and publications relating to water resources.

Surface water supply of Hawaii, July 1, 1913, to June 30, 1915, G. K. LARRISON (*U. S. Geol. Survey, Water-Supply Paper 430 (1917), pp. 329*).—This report presents the results of measurements of flow made on certain streams

and ditches, and records of rainfall and evaporation in the Territory of Hawaii for the biennial period ended June 30, 1915.

The flowing wells of western Queensland, J. W. Gregory (*Queensland Geogr. Jour., n. ser., 30–31 (1916), No. 16–17, pp. 1–29, pl. 1, figs. 4*).—The general characteristics of these artesian wells are discussed.

Tile drainage on the farm, E. R. Jones and O. R. Zeasman (*Wisconsin Sta. Bul. 284 (1917), pp. 32, figs. 22*).—This bulletin deals with tile drainage on the individual farm, discussing the benefits of drainage and some of the construction problems, and giving detailed directions for the selection and laying of tile drain. Cost estimates and other data are included.

Draining of peat lands by canals, K. H. Lundevall (*Svenska Mosskulturför. Tidskr., 31 (1917), No. 1, pp. 43–54, figs. 8*).—Methods of draining peat lands in Sweden by the use of canals are described and illustrated. The ditches are apparently designed with sufficient velocity to be self-cleaning.

Preliminary report on Kearney Vineyard experimental drain, W. W. Weir (*Irrig. Age, 32 (1917), No. 10, pp. 151–158, figs. 11*).—The substance of this article has been noted from another source (E. S. R., 36, p. 584).

Studies on the culture media employed in the bacteriological examination of water.—IV, Neutral red lactose peptone media, E. M. Chamot and C. M. Sherwood (*Jour. Amer. Chem. Soc., 39 (1917), No. 8, pp. 1755–1766*).—In a fourth report of studies on culture media for the bacteriological examination of water (E. S. R., 34, p. 286) experiments were conducted to ascertain (1) the influence upon the color change of an increased amount of peptone alone instead of the usual 1 or 2 per cent peptone with meat broth or meat extract; (2) the effect of systematic variations of the various components; that is, peptone, lactose, acidity, salt, and neutral red, on the sensitiveness of the contrast reaction; (3) the effect of these variations on the volume and composition of the gases formed; (4) the true nature of the chemical reactions involved in the color change; (5) the value of neutral red medium as an indicator of fecal pollution, other than human, in drinking water. The following conclusions were drawn:

"A neutral red medium composed of from 3 to 4 per cent peptone, 0.8 per cent potassium chlorid or potassium sulphate, 0.6 per cent lactose, 0.008 per cent neutral red with a reaction of +1 per cent affords a very sensitive and accurate medium for the speedy detection of fecal pollution by bacteria. The addition of meat broth increases the sensitiveness of the medium but is not essential. The yellow fluorescent compound formed by the action of the bacteria is probably dimethyldiaminomethylhydrophenazin, a simple reduction product of neutral red. Ammonia does not enter into the formation of the reduction product. The Stokes neutral red medium is a convenient and reliable one for the detection of fecal contamination in water and is more sensitive than lactose bile."

Seasonal distribution of soil and fecal strains of the colon-aerogenes group in surface waters, Myrtle Greenfield and W. N. Skourup (*Jour. Indus. and Engin. Chem., 9 (1917), No. 7, pp. 675–678*).—Experiments conducted at the Kansas State Board of Health water and sewage laboratory on the variation of the organisms of the colon-aerogenes group in the surface water supplies of Kansas are reported.

It is concluded that "there seems to be no difference between soil and fecal strains of organisms of the colon-aerogenes group from surface water supplies in their resistance to treatment, nor is there a difference between cultures of the four principal groups of MacConkey, isolated from surface water supplies, in their resistance to treatment. There is a correlation between the increase in the fecal strains of organisms of the colon-aerogenes group during dry weather and the sanitary survey."

Disinfection of water by means of bleaching powder, H. LANGER (*Ztschr. Hyg. u. Infektionskrank., 81 (1916), p. 296; Chem. Ztg., 41 (1917), Repert., p. 166; abs. in Jour. Soc. Chem. Indus., 36 (1917), No. 13, p. 733*).—A distinction is drawn between disinfection, i. e., rendering bacteria harmless, and the killing of bacteria. In the case of bleaching powder, disinfection is dependent only upon the concentration of the available chlorin, not upon the duration of the exposure. The action is a rapid one and does not consist in oxidation but in absorption of chlorin. The time required to kill the bacteria depends only upon their power of resistance to the injury effected by the chlorin. Disinfection, therefore, is independent of the time elapsing before neutralization of the chlorin. Whether this follows at a longer or shorter interval, the killing of the bacteria is not influenced. The presence of organic matter reduces the concentration of the available chlorin, though the amount of this reduction can only be determined by a bacteriological test. The disinfecting action is rendered greater by adding the bleaching powder in fractions, a cumulative effect replacing that of concentration.

The interaction of chlorid of lime with the normal constituents of natural waters and sewage, G. W. HEISE (*Philippine Jour. Sci., Sect. A, 12 (1917), No. 1, pp. 17–35, figs. 5*).—Studies of the rate of decomposition of chlorid of lime in water, sewage, and solutions of organic substances are reported.

It was found that "in the dark, at 28° C., the reactions proceeded with almost constant velocity for periods of 30 minutes to one hour, after which they proceeded very slowly. In the light the decomposition rate was greatly accelerated. In general, the amount of available chlorin consumed is proportional to the concentration in which it is added, as shown by the interaction of chlorid of lime and urea solution. However, for certain definite concentrations of sewage this regularity fails. A study of the reaction between chlorid of lime with varying quantities of urea showed that the chlorin consumption, as measured by the starch-potassium iodid reaction, is not necessarily proportional to the concentration of organic matter. The determination of the chlorin consumption of a water or sewage, though of importance in the control of hypochlorite disinfection, is not sufficient in itself and should be supplemented by bacteriological tests."

The construction and operation of concrete septic tanks, H. C. CAMPBELL (*Dom. Engin., 80 (1917), No. 13, pp. 488–490, figs. 2*).—Notes are given on residential sewage disposal by means of small septic tanks and tile absorption areas.

Practical road building, C. E. FOOTE (*Philadelphia: David McKay, 1917, pp. XX+11–295, figs. 40*).—This is a popular treatise on the subject for the benefit of the layman, containing chapters on road history, location, grades, drainage, foundations, surfaces, bridges and culverts, traffic and finance, and on earth, gravel, sand clay, topsoil, macadam, brick, concrete, bituminous, sand asphalt, and special surface roads.

Serial bonds for road building save money, M. O. ELDRIDGE (*Engin. News-Rec., 79 (1917), No. 9, pp. 407–411, figs. 5*).—Tabular and graphic data are reported and discussed from which the conclusion is drawn that on the basis of definite comparisons between the ultimate costs of different types of bonds for road building the serial type is the most desirable. "Especially in local road-improvement work, where the sinking funds lead to many troubles, serial bonds are greatly to be preferred. . . .

"Bond issues ought to be resorted to only where they can not be avoided. It should be a fundamental rule in the financial operations of a county or township that all current expenses, such as for the maintenance of roads, be paid from the proceeds of an annual tax levy. Furthermore, if a township or

county is able to levy a sufficient tax to improve all of the roads required in a reasonable length of time without imposing too great a burden on the taxpayers, it should by all means adopt this course. The only defense that can be offered for a local bond issue rests upon the common sense principles of payment by installment and of capitalizing undeveloped resources. If a system of roads is to be built, it is usually of common advantage that the people who may be called upon to pay the bills should be permitted to distribute their contributions over a period of years and that all who share in the benefits should also share in the burdens."

"On January 1, 1915, the total local road and bridge bonds outstanding in the United States, exclusive of cities, amounted to approximately $230,000,000. It is estimated that at least $160,000,000 of these bonds were of the sinking-fund variety; that the average term was 25 years; and that the average rate of interest was 5 per cent. If these bonds had been issued as serials, for the same term and bearing the same rate of interest, it would have resulted in a total saving of approximately $42,000,000, or an average annual saving of $1,680,000."

Tests of concrete road aggregates, J. P. Nash (*Good Roads, n. ser., 14 (1917), No. 9, pp. 107–110, 114, fig. 1*).—Tests made at the University of Texas to determine the resistance to abrasion and the tensile strength of concrete made from various aggregates are reported. In the tests the chief variable was the coarse aggregate.

It is pointed out that "the two most important essentials for a satisfactory road are (1) uniformity of wear and (2) a minimum of wear. Whenever these two are combined with a high tensile strength the most satisfactory concrete road is found. The conclusions drawn from these tests are as follows:

"The uniformity of wear is obtained when the mortar and the coarse aggregate wear equally, such as when crushed limestone or limestone gravel is used. The coarse aggregate should be limited in size to about 1.5 in. When hard, tough stone is used the size should be limited to about 1 in. and the cement content increased. It is questionable if a richer mix than a 1:2:4 is an economical one to use with crushed limestone of the ordinary hardness. Crushed slag when hard and uniform should be satisfactory as a concrete road aggregate. In a 1:2:4 concrete, a gravel composed of very hard stone such as flint, or quartz, does not wear uniformly. The action of the cubical shot on the test specimens is a trifle more severe than the traffic on the road. It can not be said that either the crushed stone or gravel tested is superior as an aggregate to produce concrete having a higher tensile strength."

An analysis of poppet valve motion, L. T. Knocke (*Gas Engine, 19 (1917), No. 9, pp. 436–440, figs. 6*).—This is a mathematical analysis of valve mechanism for gas engines.

A new feed rack for winter feeding, H. C. Gardiner (*[Bien.] Rpt. Mont. Live Stock Sanit. Bd., 1915–16, pp. 17, 18, pl. 1*).—A cattle feeding rack and sheep feeding rack designed for Montana conditions are described and diagrammatically illustrated.

Poultry house equipment, A. G. Philips and L. L. Jones (*Purdue Univ., Dept. Agr. Ext. Bul. 57 (1917), pp. 12, figs. 9*).—Nests, feed hoppers, and watering vessels are described and diagrammatically illustrated.

RURAL ECONOMICS.

The farm-labor problem, D. F. Houston (*Washington, D. C.: U. S. Dept. Agr. [1917], pp. 4*).—This pamphlet calls attention in a general way to the farm-labor problems, and indicates that the most promising solutions are, first, a systematic survey of the farm-labor situation in order to ascertain the possible

needs of the farmers and to determine ways of meeting them; second, the promotion of fuller cooperation in the utilization of labor among farmers in the farm communities; and the further development of machinery in assisting in the transfer of labor from one section to another; third, making available labor which has not before been fully or regularly utilized in farming operations; fourth, the replacing of men for agricultural purposes, as far as possible, by woman laborers and by diverting labor from relatively non essential enterprises; fifth, by seeing that all able-bodied men not now doing useful or regular work shall be fully and regularly employed; and, sixth, the largest possible production and the fullest possible use of farm labor-saving machinery.

Farm labor, A. AGEE and F. APP (*N. J. Agr. Col. Ext. Bul. 1 (1917), No. 18, pp. 31, figs. 11*).—In this bulletin the authors have discussed the reasons for the farm labor shortage, and suggest possible sources of additional workers. They have also discussed methods of boarding and lodging laborers, especially the different kinds of camps that have been used in providing shelter for men and boys in organizations.

The farm-labor problem, W. H. MANSS (*Baltimore, Md.: B. & O. R. R. Co., 1917, pp. 10*).—This pamphlet discusses the effect of the war upon farm-labor problems, and outlines a scheme for the organization of agricultural armies of boys to undertake farm work during the summer months.

The problem of crop production, J. BRACKEN (*Saskatchewan Dept. Agr. Bul. 48 (1917), pp. 24, figs. 12*).—The author, in discussing conditions in Saskatchewan, indicates that the elements essential to profitable production of crops are to know the factors that affect the growth of crops, the profitableness of production, the permanence of agriculture, and the methods used for their control. The factors affecting growth are considered as good seed, plenty of plant food, and sufficient heat, light, water, and air. The factors affecting profit are loss from weeds, insects, rust, hail, and those affecting the cost of production and controlling the selling price. The factors affecting the permanence of agriculture are the method of dealing with the soil, maintaining its health and keeping it free from weed seeds and plant diseases, and maintaining sufficient amounts of available plant food.

State help for agriculture, C. W. TOMKINSON (*London: T. Fisher Unwin, Ltd., 1917, pp. 189*).—Among the suggestions for improving British agriculture are the establishment of an import duty on wheat and other grains, the provision of capital by the State, and a system of administration providing for instruction to the individual farmer with reference to the management of his farm.

Corn production act, 1917 (*London: Govt., 1917, pp. II+26*).—This pamphlet contains a discussion of the act effective August 21, 1917, for encouraging the production of grain in Great Britain and Ireland. It guarantees a minimum price of wheat and oats, a minimum wage for agricultural workers, makes restrictions on the raising of agricultural rent, and extends the powers of the authorities in encouraging cultivation

The expert agricultural adviser in the region of the Chateau-Gontier, A. BECKERICH (*Ann. Sci. Agron., 4. ser., 5 (1916), No. 7–9, pp. 371–392*).—The author discusses the work and value of such an advisor, indicating the kind of farming to be followed, the types of farm operations, and his value to the agriculture of the community.

County boards of agriculture and list of granges (*N. J. Dept. Agr. Circ. 8 (1917), pp. 62*).—This report gives a brief statement of the activities of the county board of agriculture, together with the principal officers in the various granges in the State.

South Dakota system of rural credits [1917] (*Pierre, S. Dak.: Rural Credit Bd., [1917], pp. 8*).—This pamphlet contains information for prospective borrowers upon farm land as to the workings of the rural credit act of that State.

The cooperative movement among farmers in the United States, LOUISE MERRIMAN (*Syracuse, N. Y.: Syracuse Univ., 1917, pp. 35*).—This is a bibliography relating to agricultural cooperation, and the author has classified the books as those general in nature and those that relate to the commercial, educational, political, and social phases. Both books and magazines are included in the list.

The operations of the national cooperative organization during the war (*L'Opera della durante il Periodo della Guerra. Monza, Italy: Lega Naz. Coop., [1916], pp. 36*).—This report discusses the duties of the general secretary of this body, the functions of the central office at Rome, and the activities of the society in such matters as carrying on propaganda and meeting the war situation with reference to food and labor, and gives data regarding the growth of the organization during 1915.

Cooperative marketing, W. W. CUMBERLAND (*Princeton, N. J.: Princeton Univ. Press, 1917, pp. VIII+226*).—This publication describes the methods and organizations connected with the marketing of California citrus fruit products.

Marketing survey of New Haven, L. D. H. WELD (*New Haven, Conn.: Yale Univ., 1917, pp. 52, figs. 4*).—In this report have been discussed the various methods of distributing products in New Haven, with the recommendation that the various organizations concentrate on the establishment of a well-organized farmers' wholesale market. For the present it advocates the use of the markets now in use, but in the future there should be established an open market place with assignments to individual farmers at a small rental per day or per season, and a marketmaster chosen, regulations prescribed, and the necessary city ordinance drawn up and passed without delay. It considers that the retail farmers' market, retail dealers' market, and the wholesale dealers' market are not essential under present conditions.

The wheat situation, present and prospective, T. K. DOHERTY (*Agr. Gaz. Canada, 5 (1918), No. 1, pp. 109–112*).—The author has discussed the wheat situation by comparing data for 1916 and 1917 with the five years 1907–1913, grouping his data as South Mediterranean and the Cape, neutral countries open to the world's commerce, importing allied countries open to the world's commerce, and exporting countries open to the world's commerce.

The restrictions of consumption of grain products in European countries, E. PAYEN (*Écon. Franç., 45 (1917), II, No. 49, pp. 725–727*).—This paper indicates the articles restricted, variations in different countries, and methods used.

Conditions in the sugar market, January-October, 1917 (*New York: American Sugar Refining Co., [1917], pp. 78, pl. 1, figs. 7*).—In this report are discussed the world's sugar supply, the effect of the war upon the supply, and market conditions during the first half of 1917. It also contains statements with reference to the consumption in the United States and arrangements with the Food Administration with reference to facilitating distribution.

Live stock statistics (*Internat. Inst. Agr. Rome, Internat. Crop Rpt. and Agr. Statis., 8 (1917), No. 11, pp. 878, 879*).—These pages contain data as to the number of horses in Scotland in 1917, the 47 governments in European Russia in 1916, and for New Zealand in 1917, with comparative data for earlier years.

Reply of Swift & Company to questions submitted July 23, 1917, by the Federal Trade Commission (*Chicago, 1917, pp. 33, pls. 3*).—This report discusses prices of live stock, meat, and meat products, the demand for and supply of meat, the services performed for middlemen in the meat trade, the functions

of the packing-house system, and the weaknesses in existing methods of production and marketing of live stock.

Monthly crop report (*U. S. Dept. Agr. Mo. Crop Rpt.*, *3* (*1917*), *No. 12*, *pp. 117–136*, *fig. 1*).—This number contains data showing the final estimate of the 1917 acreage, average yield and production, price, total farm value, and value per acre for the principal farm crops. It also contains data with reference to production of tobacco by types and districts, and the monthly prices for a series of years for principal farm crops, together with estimated farm value of important crops November 15, as well as average prices received by producers and range of prices of agricultural products at important markets. There are special reports regarding winter and spring truck crops, sugar beets and beet sugar for 1917, a December estimate of the cotton crop, crop statistics by States for 1915–1917, winter wheat acreage, clover seed production, sugar beet seeds, estimated production of hay in 1916–17 by kinds, aggregate crop values for 1917 with comparisons with earlier years, percentage of total corn crops consisting of white, yellow, and mixed corn, acreage of winter wheat and rye sown in 1917, etc.

[Agricultural statistics of Canada] (*Canada Yearbook*, *1916–17*, *pp. 176–249*, *pl. 1*, *fig. 1*).—Among the data included in these pages are those relating to weather conditions, production, foreign and domestic trade in agricultural products, manufacturing of agricultural products, prices, and public lands.

Census of Manitoba, 1916 (*Census and Statis. Canada Bul.*, [*1917*], *pp. 13.*)—This report contains data regarding urban and rural population, the number of farms and the distribution of the land among the different agricultural purposes, area sown to various crops, production and value, and number of live stock of different classes for 1916.

[Agricultural statistics of Argentina] (*Argentine Year Book*, *10* (*1915–16*), *pp. 210–252*).—These pages contain data for 1914 with reference to the area cultivated and the area under specific crops, trade in agricultural products, agricultural cooperative organizations, live stock, rural holdings, public lands, and industries allied to agriculture.

Agriculture in Switzerland during the crop year 1915 (*Ann. Agr. Suisse*, *18* (*1917*), *No. 2*, *pp. 30–49*).—This report discusses weather conditions, damage to crops, extent of the harvest and the milk production, diseases affecting live stock, export and import trade, prices, and interest rates.

Agricultural income in Switzerland, 1915–16 (*Ann. Agr. Suisse*, *18* (*1917*), *No. 2*, *pp. 50–205*).—These pages contain data for the crop year 1915–16, showing the incomes of various agricultural exploitations and also giving data regarding the persons employed, crops obtained, wages, and interest.

Area, classification of area, area under crops, live stock, land revenue assessment, and transfers of land in certain native States, G. F. Shirras (*Agr. Statis. India*, *31* (*1914–15*), *II*, *pp. V+116*).—This report continues information previously noted (E. S. R., 36, p. 291) by adding information for another season.

AGRICULTURAL EDUCATION.

Annual report of the Federal Board for Vocational Education, 1917 (*Ann. Rpt. Fed. Bd. Vocational Ed.*, *1917*, *pp. 32*).—This is the first annual report of this board under the act previously noted (E. S. R., 36, p. 701).

The board has in progress studies and investigations of vocational problems in connection with the military departments of the Government; vocational rehabilitation of crippled soldiers and sailors; training teachers, supervisors, and directors of agriculture; plant and equipment for agricultural schools; the

organization of secondary schools in agriculture, including courses of study and supervision; materials and methods in secondary school agriculture; supervised practical work in agriculture, including the home project method of instruction; teacher training for trades and industries; home economics education as vocational education in schools and classes receiving Federal aid; teacher training for the teaching of home economics subjects; suggestive courses of study and content of courses in home economics; etc.

The report also includes a statement of the response of the States to the act as regards the designation of State boards to cooperate with the Federal board, appropriations for vocational education, etc., and a tabular statement of the allotment of the Federal funds to the States for the fiscal year 1918. The act had been accepted by all States except North Dakota and Rhode Island. In 29 States the State board of education was designated as the cooperating board; in New York and West Virginia the board of regents was designated; in Colorado the State board of agriculture, in Minnesota the State high-school board, and in Wisconsin the State board of industrial education; while in Alabama, Georgia, Illinois, Iowa, Maine, Michigan, Mississippi, Nebraska, New Hampshire, North Carolina, Oklahoma, and Oregon, new boards for vocational education were created. There are no records of acceptance of the act by North Dakota and Rhode Island.

The total allotment to the States is $1,655,586.72, of which $547,027.79 is for the salaries of teachers, supervisors, and directors of agriculture, $564,444.89 for salaries of teachers of trade, home economics, and industries, and $544,114.04 for salaries of teachers and maintenance of teacher training. Of the States New York received the largest appropriation. namely $154,210.39, of which $19.535.60 is for agriculture, $84.950.35 for trade, home economics, and industry, and $49,724.44 for teacher training. Thirteen States received the minimum of $15,000.00 each. The largest allotment for agriculture made to a single State was $30,744.79 to Pennsylvania, while 16 States received $5,000 each, the minimum allotment.

Statement of policies (*Fed. Bd. Vocational Ed. Bul. 1 (1917), pp. 70, fig. 1*).—This bulletin presents a preliminary and tentative summary of the policies thus far adopted by the Federal Board for Vocational Education for administering the Smith-Hughes Act. Part 1 includes general policies or standards, and Part 2, principally rulings upon and a discussion of points. raised at the hearings given to the State boards for vocational education. Two appendixes contain the text of the act; an analysis of the legal requirements imposed upon the States, the Federal board, the Secretary of the Treasury, the custodian for vocational education, etc.; and statistical tables showing the total annual grants by the Federal Government under the act for vocational education in agriculture, trade, home economics and industries, and for teacher training for the fiscal year 1918.

Federal aid for vocational agriculture in Texas under the Smith-Hughes Law (*Dept. Ed. Tex. Bul. 68 (1917), pp. 14*).—This bulletin outlines the conditions governing Federal aid for vocational agriculture in Texas under the provisions of the Smith-Hughes Act, including a statement of the approximate appropriations available during the next 10 years.

Under the plan announced, Federal aid may be given to vocational agricultural departments in high schools classified by the State department of education, special vocational agricultural schools, and part-time or evening classes for vocational agriculture. The community board of control of vocational agricultural departments in classified high schools must provide a $200 equipment as a minimum and such additional equipment as may be required by the State board for vocational education, and lease or purchase suitable

land of at least one acre and sufficient to provide 0.1 acre for each person enrolling for plant production projects. The community boards of control of special schools of agriculture must provide a $500 minimum equipment, 10 acres of suitable land, the necessary buildings, and such additional equipment as the State board may require. The teachers of vocational agriculture must be employed on a 12 months' basis at a minimum salary of $1,200. Federal funds may be used for only that portion of a teacher's time devoted to vocational agriculture.

The courses of study for vocational agricultural schools and departments must consist of 4 years' work, 50 per cent of which time each year must be devoted to instruction in agriculture, demonstrations, supervised agricultural projects, and supervised study in agriculture and project work, and the remaining time to such subjects as will give additional cultural and good citizenship training. Each student must do six months' supervised project work each year, and each project must be visited by the supervisor in charge at least once each month.

The qualifications of all teachers, supervisors, or directors of vocational agriculture include graduation from a standard agricultural college, or its equivalent, at least two years of actual working experience on a farm after the twelfth birthday, one full year's course in education or its equivalent, one-half year of agricultural teaching experience in a secondary school or its equivalent, etc. After July 1, 1921, these qualifications will include the completion of a 4-year college course in vocational agricultural education with 144 semester hours' work, at least 40 hours of which must be technical agriculture and from 15 to 24 hours professional training, including supervised practice teaching in secondary agriculture. Upon the completion of this course a permanent teacher's certificate will be granted by the State department of education. The admission requirements to this course will be 14 units of high-school work.

A possible core for a program in agricultural education, T. H. Eaton (*School and Soc., 6 (1917), No. 157, pp. 755–761*).—The author defines agriculture in its narrowest, modern technical, and broadest sense, stating the prime requisites to success in each. In his opinion agricultural education may mean apprenticeship in the processes of husbandry, scientific instruction in the technology of production from the land, or preparation for intelligent entering upon the life of a farmer. These three aspects are prevocational, vocational, and liberalizing. To serve as a guide to those activities which must be participated in by learners fitting themselves for the life of a farmer, he submits a crude classification of certain activities that seem to him common to the lives of American farmers, followed by suggestive possible activities of the learner in two or more of three categories, viz., primary activities for the acquirement of first-hand meanings and a greater or less degree of skill, secondary activities for organized knowledge and adaptability to varying situations, and tertiary studies for the sake of insight and appreciation.

Sixteenth annual general report of the Department of Agriculture and Technical Instruction for Ireland, 1915–16 (*Dept. Agr. and Tech. Instr. Ireland, Ann. Gen. Rpt., 16 (1915–16), pp. VI+201*).—This is the usual annual report on the department's administration and funds, with details of operations during the year 1915–16, including agricultural and technical instruction.

Soil physics and management, J. G. Mosier and A. F. Gustafson (*Philadelphia and London: J. B. Lippincott Co., 1917, pp. XIII+442, pl. 1, figs. 202*).—This book, which has been written as a textbook for the agricultural student, a reference book for the practical farmer, and an aid to the land owner desiring information in the personal management of his land, emphasizes the prin-

ciples of soil physics and omits the details of practice except where necessary for purposes of illustration. It treats of soil material and its origin and placing, weathering, classification of soils, constituents, physical properties, control of moisture and irrigation, alkali lands and their reclamation, temperature, soil air and soil aeration, soil organisms, tillage, erosion, and rotation. Each chapter is followed by review questions and references to literature. Three appendixes deal respectively with soil fertility including some of the underlying principles, data with reference to the average yields of crops, the value of farm land and property, and crop acreage production, by means of maps.

Home economics in the Detroit schools, CHARLOTTE KEEN (*Jour. Home Econ., 8 (1916), No. 9, pp. 479–487*).—This is an account of the present status of home economics instruction in the elementary, secondary, junior high, and trade schools of Detroit, Mich.

The first classes in home economics in the Detroit public schools were formed on December 4, 1899. Instruction is now compulsory in the grades, the junior high schools, and in one year of the high schools.

Instruction in hand sewing is given in the fourth and fifth grades and in simple dressmaking in the eighth grade. Domestic science is taught in the sixth and seventh grades. The aim of the domestic science work in the grades is to teach dexterity in the handling of utensils and the manipulation of food stuffs. Simple experiments with carbon dioxid, water, starch, albumin, gluten, baking powder, and yeast are performed. About one-half of the kitchens have individual equipments and in the others the group-of-two method is employed. The equipment is for 24 or 32 pupils, and special effort is made to make the work as much like home processes as possible. In most of the grade schools one period of 90 minutes a week is given to domestic science, but in some, two or more 90-minute periods are devoted in the grades to this work.

In the secondary schools the various textiles in relation to production, manufacture, and cost are studied, and taste and judgment are developed in the selection and use of materials. Sufficient constructive skill is cultivated to enable the student to make her own clothes. Sewing is usually given four periods a week with two hours' credit. The course in domestic science includes instruction in infant and invalid diet, household management, the household budget, the cost and purchasing of food, housewifery and laundering. One year of either sewing or cooking is required for credit.

Suggested plans for the serving of lunches in centralized schools of Ohio, TREVA E. KAUFFMAN (*Agr. Col. Ext. Bul. [Ohio State Univ.], 13 (1917–18), No. 5, pp. 48, figs. 5*).—The work suggested is intended to be a part of the regular home economics course in the school with full credit and laboratory time. The plan includes the assignment of committees for each of the various processes. Receipts and lists of equipment and supplies, foods grouped according to their predominant food nutrient to facilitate having a well balanced meal, data on cost of lunches, and references to the literature are given; also suggestions for general management, making calculations, reducing costs, and keeping accounts when either a complete or supplementary lunch is served.

Schoolboys on farms: A war time experiment, W. I. HAMILTON (*Amer. School Bd. Jour., 56 (1918), No. 1, pp. 21–23, 76–78*).—The author discusses the principles of mobilization of schoolboys for farm work in Massachusetts, coöperation, office administration, camps, sites and equipment, camp management, evaluation of the movement, and plans for the future.

NOTES.

Purdue University.—G. I. Christie, superintendent of agricultural extension, has been granted leave of absence to become assistant to the Secretary of Agriculture, in charge of this Department's activities in remedying farm-labor problems. T. A. Coleman, State leader of county agents, will serve as extension director during his absence.

Massachusetts Station.—Dr. W. P. Brooks has been granted leave of absence as director, on account of ill health, until September 1, and F. W. Morse has been appointed acting director. James P. Buckley, jr., and B. L. Peables have resigned as assistant chemists, and Harold B. Pierce has been appointed assistant chemist.

Minnesota University and Station.—Francis Jager, chief of the bee division, and C. P. Bull, professor of agronomy, have been granted leave of absence on an agricultural mission to Serbia for the American National Red Cross. A tract of about 30,000 acres of rich and practically virgin soil near Monastir is to be put into cultivation by the use of modern equipment and improved seed shipped from this country. It is hoped to relieve materially the food shortage in the region by this enterprise.

A. H. Benton, assistant professor of farm management, has accepted a position as professor and chief of the division of farm management and rural economics at the Manitoba Agricultural College, beginning August 1. Dr. C. B. Lord, of the veterinary division, has received an appointment in the Bureau of Animal Industry of the U. S. Department of Agriculture. Miss Stella Palmer, assistant professor of foods and cookery, has been appointed chief of the division of home economics at the University of Arkansas, beginning August 1.

Science announces the retirement of T. L. Haecker at the close of the college year, July 31. R. J. Garber has been appointed assistant in plant breeding in the station.

Montana College and Station.—The contract has been let for a new chemical building to replace that burned in October, 1916. A 3-story structure 117 by 58 ft. is planned, with provision for a subsequent extension to a frontage of 160 ft. The cost is to be $107,000 exclusive of furnishings. The college and station work in chemistry will be housed in the new building.

A tract of nearly 20 acres has been added to the college campus, making a total of over 100 acres. A permanent plan for the future development of the buildings and grounds has just been completed.

Nebraska University and Station.—L. W. Chase, professor of agricultural engineering, has been appointed major in the Ordnance Corps, U. S. Army. C. W. Smith, county agent of Seward County, and C. D. Kinsman, extension assistant in rural engineering at Purdue University, have been appointed associate professors in agricultural engineering. H. B. Pier has resigned as assistant professor of animal husbandry. John A. Luithley has been appointed assistant professor in dairy husbandry.

Oklahoma Station.—Dr. John E. Guberlet has been appointed parasitologist, effective July 1.

South Dakota College and Station.—Christian Larsen, head of the dairy husbandry department, has been appointed director of extension, vice Gordon W. Randlett resigned.

THE AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES.

U. S. DEPARTMENT OF AGRICULTURE
STATES RELATIONS SERVICE
A. C. TRUE, DIRECTOR

Vol. 38 MAY, 1918 No. 7

EXPERIMENT STATION RECORD

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1918

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[1] Director. [2] Agronomist in charge. [3] Animal husbandman in charge. [4] Acting director.

EXPERIMENT STATION RECORD.

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U.S. Department of Agriculture—Contd.

[1] Printed in scientific and technical publications outside the Department.

EXPERIMENT STATION RECORD.

Vol. 38. May, 1918. No. 7.

The employment of experiment stations as a basis for the sound development of agriculture has been a characteristic feature in the administration of the territorial possessions of the United States and has constituted one of the important forms of aid rendered to these dependencies. One by one these regions have been provided with stations, usually equipped and maintained chiefly by Federal appropriations, until an interesting and in some respects novel group has been developed.

Some of the noteworthy features of the stations in these insular possessions were outlined in these pages about ten years ago, at the time of the establishment of the station in the Island of Guam. The interval has been one of steady development, and the group is now to be extended by the addition of a station for the Virgin Islands.

The oldest of this group of stations is that located at Sitka, Alaska, which was established in 1898, after a preliminary survey of conditions and agricultural features of the coast country. The stations in Hawaii and Porto Rico followed in 1901, and the Guam Station was opened in 1908 as mentioned above. They thus represent widely separated geographical areas, which mark the extremes in territorial expanse of the country with the exception of the Philippine Islands, and climatic conditions are presented ranging from the arctic zone to the tropics, with scarcely less radical differences in many other respects.

The administration of this group of stations, it will be recalled, differs materially from that of the experiment stations within the States. They receive no funds under the Hatch and Adams acts, nor are they directly connected with the agricultural colleges which have been provided under the Morrill fund in Hawaii and Porto Rico. They are maintained from specific annual appropriations carried in the appropriation act for the Department, and they are Federal stations supported almost exclusively by congressional appropriations, with no regular aid from the local governments. Originally established by the Department under the direct supervision of the Office of Experiment Stations, they are still administered through a division of insular stations of this Office as a part of the States Relations Service.

These stations and their environment, therefore, present many unusual features, which with the character of their special problems and the relatively pioneer conditions under which they are operating, lend special interest to them and to their success in developing and improving the agriculture of these outlying possessions.

The primary purpose of the stations in Alaska has been to work out the possibilities for agriculture in that northern region, and to develop types of farming suited to the country. The first station was located at Sitka, then the capital of the Territory, which has remained the headquarters of the agricultural work; but climatic, soil, and other features differ so widely in Alaska that it was planned from the first to locate branches in various other sections typical of conditions or the prospective opportunity for agricultural development. This plan has been followed, and there are now in operation additional stations at Rampart and Fairbanks in the interior some 400 miles back from the coast, on the Island of Kodiak near the entrance to Cook Inlet, and at Matanuska on the line of the Government railroad which is being constructed into the interior.

Plant breeding and the introduction and testing of varieties have occupied a large amount of attention in the Alaska work, and some very successful results have been secured through the introduction of economic plants from other countries of high latitude or elevation. Varieties of oats, barley, rye, and spring wheat have been secured from other countries that ripen during the average season, and the necessary period of growth has been reduced through selection and the development of hybrids. Varieties of barley have been produced that breed fairly true to type and that ripen from ten days to two weeks earlier than the parent plants. At the Sitka station, hybrid strawberries of excellent quality have been developed which have proved hardy not only for the coast region but also in the interior valleys. Much attention has naturally been given to vegetable growing, with such success that it has become widespread and the local needs for a wide range of vegetable foods are now being met. The stations have also introduced and established hardy alfalfas for the great interior valleys, and have added other valuable forage crops to the indigenous species.

For about ten years experiments with sheep and cattle have been in progress on Kodiak Island, and except for the interruption in 1912, due to the eruption of Mt. Katmai, sheep and Galloway cattle have been maintained almost wholly on locally produced forage and pasture. The Galloways have proved perfectly hardy, but as there is a demand for milch cows an attempt was begun in 1917 to produce a dual-purpose animal by making reciprocal crosses between the Galloway and the Holstein breeds.

With the construction by the Government of a railroad connecting Seward and Fairbanks, Alaska, attention has been directed to the character of some of the regions through which it passes. Under the auspices of the Alaskan Engineering Commission, a reconnoissance survey of part of this Territory was made by the Bureau of Soils of this Department in 1914. In the Cook Inlet-Susitna region, there is reported to be more than a million and a quarter acres of land possessing topographic and drainage characteristics and chemical and physical properties quite favorable to farming. About one-half of this good land is to be found in the Susitna and Matanuska Valleys.

In making appropriations for this Department for 1918, Congress authorized the establishment of an agricultural experiment station in the Matanuska Valley. In anticipation of such action, a preliminary survey of the valley was made in 1915 and a site for the station selected and reserved about two miles from Matanuska Junction, the point where the branch line from the Matanuska coal mines joins the main line. This tract, which embraces 240 acres, was set aside for use as an agricultural experiment station by executive order dated September 20, 1915.

The entire area of the valley is more or less covered with birch and spruce timber, with cottonwoods along the creek bottoms. The soil is a silt loam that has been found by settlers to be fairly productive. Even before the railroad was begun there were some settlers in these valleys, and there are now several hundred homesteads in the vicinity of the station. This region differs from those in which the other experiment stations in Alaska are located in that it combines some of the continental features found in the interior valleys with the modified climatic conditions of the coast.

In the spring of 1916 some cooperative work was begun with a number of farmers to test various grains that had been produced at the Fairbanks station. On account of unavoidable delays and a very backward season early seeding was impossible, but several varieties of barley and oats proved well adapted to the region and quite satisfactory yields of hay and grain were reported. Some limited experiments with vegetables and small fruits have been undertaken, the results of which indicate that these also can be successfully produced in that region.

With the immediately available appropriation, work was begun in the spring of 1917 on the establishment of the Matanuska station. Mr. F. E. Rader, who had been formerly connected with the work at Rampart, was placed in charge at Matanuska, and the clearing of land, erection of buildings, fences, etc., was begun. By the close of the season, a number of acres had been cleared and prepared for

planting in the spring of 1918, and the immediately necessary buildings had been erected. The experimental field work will be begun this season. In the meantime, the cooperative work with settlers will be continued, not only to obtain data but to demonstrate what food crops can be produced for local consumption. Local markets, due to the railroad constructon, are available, and every effort is being made to stimulate the production of those crops that experiments have shown can be reasonably expected to succeed.

The line to be immediately taken up by the station is that of adapting agriculture to the near-by valleys. Efforts will be made to test various field and garden crops and through breeding experiments to improve their adaptability to the region. Later it is expected to conduct experiments with live stock, as it is believed the valley where the station is located is well adapted to dairying.

The work in Alaska has been under strictly pioneer conditions such as are rarely to be found at present in continental United States. There has been little to guide since so little had been done in the way of personal effort and so little confidence was felt in the possibilities of agriculture. It has been necessary therefore to determine the prospects for crop production, in addition to working out ways and means, which constitutes the main field of the experiment station. From the data now on hand it is believed possible to recommend with a fair degree of confidence the crops and vegetables that may be expected to succeed in all the more important agricultural regions.

In Hawaii, the problem chiefly demanding attention on the part of the station has been that of diversifying agriculture. No work has been done on the leading agricultural industry, sugar production, but much effort has been expended in trying to develop minor crops and thus to aid in establishing a permanent type of citizenship on the land. Much of the best agricultural land is held by estates or under lease to corporations, but there is abundant land for individual holdings if properly administered.

As the Hawaiian Islands are of volcanic origin, their soils present some rather unusual features, and soil studies have formed an important part of the station's work since its establishment. Surveys have been made of many of the more important soil types and their physical and chemical characteristics determined. In many of the soils a high manganese content is found, and such soils are adapted only to certain crops and special methods must be followed in handling them.

In connection with rice culture, which was an important industry when the station began its work, a study was made of the application

of fertilizers with the result that nitrate of soda, which was formerly extensively used as a fertilizer for rice, has been almost abandoned for this purpose and sulphate of ammonia is now employed as the principal source of nitrogen. Nitrate of soda was found to leach from rice soils and to have little or no residual effect, while the use of sulphate of ammonia was found highly advantageous.

The growing of pineapples for canning has recently become one of the large enterprises of the islands, the station having contributed very largely to the development of the industry. After the discovery of the injurious effect of a relatively high manganese content of the soil on the growth of pineapples, investigations were continued from which it was found that by spraying the plants four or five times during the growing season with a solution of iron sulphate yellowing was prevented and normal fruits produced. As a result of this discovery, at least 5,000 acres of land that had been abandoned for the cultivation of pineapples is being replanted to that crop.

The station has been active in the introduction of forage plants and improved varieties of grains, fruits, and vegetables, and in the prevention of losses through the control of plant diseases and insect pests. An experiment in cooperative marketing undertaken in 1913 in order to furnish an outlet for small quantities of produce of various kinds has proved quite successful, the sales increasing from $26,500 in 1914 to over $121,000 in 1917, when the marketing division was taken over by the Territory by which it is now maintained. Extension and demonstration work is being developed to some extent, especially on the island of Maui, where a considerable number of homesteaders are located.

The Porto Rico Station, which is located at Mayaguez, has, since its establishment, given much attention to soils and their management. As many of the soils of the island are peculiar in their acidity and iron and lime content, and require special management to retain their fertility, experiments have been conducted in the laboratory and field to determine their characteristics and requirements. In connection with these studies, attention has been given to lime-induced chlorosis of cane and pineapples, and considerable data have been accumulated regarding the nature of the diseases and means for their control.

Fertilizer investigations in connection with the different soil types have been made for various crops. An extensive series of experiments on the availability of different forms of phosphates for use on Porto Rican soils is in progress, a preliminary report on some phases of the work having been made recently. A survey of the bat guano deposits in more than 100 caves has been completed and the available supplies have been determined. A number of improved

methods for water culture experiments worked out by the chemist have been described in scientific journals.

One of the early lines of endeavor of the station was in the improvement of live stock through the introduction of pure-bred sires. This work has proved very popular and the results are beginning to be apparent in many parts of the island. Experiments begun on the sanitary production of milk are reported to have brought about great improvement in the quality of the milk supplies.

Attention has been given to the introduction of new crops and improved varieties of old ones with the result that many introduced varieties have to a large degree supplanted those previously grown. The value of introduced forage crops and the use of cover crops, not only for the prevention of erosion but for the improvement of the soil, and the superiority of improved varieties of fruits, etc., have been fully demonstrated.

In horticulture, citrus and coffee culture have received much attention. Fertilizer and cover crop experiments with citrus trees have indicated improved practices that have been widely applied. With coffee the experiments have had to do with soils, fertilizers, pruning, varieties, seed-bed and nursery treatment, diseases, and insect pests. Improved varieties of coffee have been introduced from other countries and some of them have proved especially adapted to Porto Rican conditions. Vanilla growing, an industry new to the island, has been developed, and it is possible that this will in time become of considerable economic importance. As very little cacao has been produced in Porto Rico, experiments are in progress that are expected to show the possibilities of developing cacao production on a larger scale. Experiments with coconuts have been in progress for a number of years, and data obtained regarding coconut culture will soon be available for publication.

As plant diseases and insect pests take heavy toll of agricultural and horticultural products in tropical countries, the Porto Rico Station has given special attention to a number of problems in connection with life history studies and means of control of some of the more important plant enemies. Beekeeping, an industry owing its origin to the station, has been developed within the past ten years, and now exports of apiary products valued at more than $330,000 are reported for the nine months ended March 31, 1918. Demonstration and extension work have been developed to a small degree, especially of late, in order to secure larger local production of food crops. As a result of a campaign conducted by the station, Porto Rico during the past year, instead of importing beans valued at $800,000 annually as in former years, supplied its own necessities and had a surplus of this product for export.

The Guam Station, which was established to aid in restoring the agriculture of the island to its former importance, has had satisfactory success in its efforts. In 1911, Morgan horses, Ayrshire cattle, Berkshire pigs, and several breeds of poultry were received for use in breeding up the deteriorated live stock then found on the island. Since that time, other pure-bred animals, including Toggenburg goats, Berkshire pigs, and poultry, have been added to the equipment of the station; and although there have been losses due to various causes among the cattle, pigs, and goats, on the whole the experiment in improving the animals of the island has proved a valuable one, several hybrid races having been established which combine the hardiness of the native stock with the larger size and other desirable qualities of the pure-bred stock.

Some experiments have been carried on with locally produced feeds from which it has been found that within certain limits, breadfruit, crushed coconuts, coconut meal, etc., can be substituted for imported or locally grown grain in feeding horses, cattle, pigs, and poultry. Preliminary to making the live-stock introductions, attention was given the question of forage production, and a number of grains, grasses, and leguminous plants were secured from other countries and sent to the station. Some of these have succeeded remarkably, among them Para and Paspalum grasses, pastures and meadows of which have been established, not only at the station but on many native ranches. Sorghums for grain and forage have proved well adapted to the local conditions, and Sudan grass, a recent introduction, has given indications of great value as a forage plant. Velvet beans, cowpeas, jack beans, soy beans, peanuts, etc., are all being tested to determine their value for forage and as green manure and cover crops.

The station has introduced upland, Sea Island, and Egyptian cottons, and from several years' tests it seems probable that the growing of certain types can be made very profitable. Attention is also being given to problems connected with raising tobacco, the question of insect control appearing to be the limiting factor in successful tobacco production. As rice growing, once a large industry, has become of minor importance, the station has undertaken experiments on all phases of rice production in order, if possible, to restore it to its former place.

An attempt has been begun to improve the corn grown on the island. This crop furnishes the staple food of the people of Guam, being about the only cultivated crop that is extensively produced. In comparative tests with many varieties from other tropical countries, the native strains of corn appeared to offer more promise of successful improvement. Selection experiments were undertaken

with these, and several pure lines have been established that outyield the parent varieties.

In horticulture, the chief experimental work has been the determination of the best seasons for planting various crops, the introduction of new vegetables and improved varieties of some of those already under cultivation, and the propagation of material for distribution among the people. As the sources from which seeds and plants may be obtained are limited, this work forms an important part in the station's activities. The Hawaii Station is cooperating most heartily in this work, and many of the best varieties of tropical fruits and vegetables found in Hawaii may now be obtained in Guam.

About 1907, the first hives of bees was introduced from Hawaii. These have done exceedingly well, having proved prolific and well suited to their surroundings. As a result of the success attained, instruction in beekeeping is given in connection with all the island schools, and many small apiaries have been established throughout the island.

The acquisition by the United States of the Danish West Indies has led to plans for the extension of experimental work to another tropical group. Provision for this was embodied by Congress in the bill making appropriations for the Department for 1919.

These islands, which were acquired from Denmark in 1916, lie 40 to 50 miles east of Porto Rico. Only three of them are of importance, St. Croix, St Thomas, and St. John, with an area of approximately 200 square miles and a population of about 36,000 people. St. Thomas and St. John are mountainous and contain little land suitable under present methods to extensive agriculture. St. Croix, the largest of the three islands, embraces most of the agricultural area, though some low mountains exist on the northern side of the island. The southern part is made up of fertile plains and low, rolling hills, being well adapted to modern agriculture.

Most of the agriculture now practiced is on St. Croix, with sugar cane and Sea Island cotton as the principal crops. On St. John there were formerly some sugar estates, but the cultivation of that crop has ceased to be of importance. St. Thomas is at present of little agricultural interest, as most of the population depends on the activities of the harbor for support. Bay rum is the only considerable product of this island. Lime and coconut trees occur in some numbers, but no systematic attempt appears to have been made to extend their planting.

The climate is said to be healthful, and the trade winds make living comfortable, especially during the cooler months. The coolest

weather is from January to March, when, in 1916, the maximum temperature was 82° F. and the minimum 65°. The hottest periods are in August and September, when the maximum and minimum temperatures were 92° and 72° F., respectively. The rainfall is rather light for the Tropics, the average for 63 years being only about 35 in. on St. Croix and even less on the other islands. If agriculture is ever extensively developed, some provision for irrigating the crops will undoubtedly have to be adopted. A hurricane visited the islands on October 9, 1916, which is reported as having been the only very destructive one for 50 years or more. Property losses were estimated at $1,500,000.

Upon the request of the Naval governor shortly after the acquisition of the islands by the United States, an agricultural survey was made of them by Mr. D. W. May, Agronomist in Charge of the Porto Rico Station. All the principal islands were visited, several weeks being spent upon them, and a report of the results of the survey with recommendations was made to the governor. Sugar and cotton were found to be the leading crops produced, with considerable areas given over to forage plants. The sugar output is about 20,000 tons per year, practically all of it being produced on St. Croix. Sea Island cotton is second in importance, more than 2,000 acres having been planted to this crop in 1913. Insect ravages and difficulties arising out of the European War caused a marked falling off in the area devoted to cotton, so that the growing of this crop was nearly abandoned. There is some attempt at cattle raising, which could undoubtedly be profitably increased. There appears to be very little effort made to grow fruits and vegetables, even for local consumption.

In 1910, an agricultural experiment station was established on St. Croix on a tract of 23 acres, two and one-half miles from Christiansted, the principal town of the island. This area has since been increased to 225 acres, about 190 acres of which can be cultivated. A concrete laboratory and office building has been erected, and a considerable amount of equipment has been provided. Experiments were begun with sugar cane to determine the best varieties for local production and the fertilizer and cultural treatments required for the best yields. Some cotton experiments have also been begun, and considerable attention is given to the growing of sorghums, maize, sweet potatoes, and various leguminous plants adapted to use as forage or as green manure crops.

With the change in sovereignty, the income of the station was impaired, and the new Congressional appropriation makes provision for a station under the management of the States Relations Service of this Department. It is expected that the present station will be taken over, and the experiments now in progress continued and others in-

augurated. Some additions to the staff are planned, to permit the taking up of studies on soils, horticulture, and possibly live stock. It is believed that a considerable cattle industry could be developed, especially on St. Thomas and St. John, and with it, dairying, which is almost unknown, could be profitably developed. Immediate attention to food production is desirable in order that the islands may be less dependent on the mainland for their maintenance.

These islands are advantageously located for the development of a large maritime shipping transfer, and it is believed with the return of normal times that they are destined to greatly increased prosperity in which agriculture can and should play an important part.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Biochemical catalysts in life and industry.—Proteolytic enzyms, J. EFFRONT (*New York: John Wiley & Sons, Inc., 1917, pp. XI+751*).—This is a translation, by S. C. Prescott, assisted by C. S. Venable, of the French text previously noted (E. S. R., 32, p. 662).

The effect of potassium bromate upon enzym action, I. S. FALK and C. E. A. WINSLOW (*Jour. Biol. Chem., 33 (1918), No. 3, pp. 453–462*).—The action of potassium bromate upon trypsin and pancreatin was investigated by means of digestion experiments with casein and determination of the amino acids produced in the presence of varying amounts of the salt. From the experimental data the authors conclude that "potassium bromate appears to exert consistently favorable influence upon the digestion of casein by trypsin in vitro in the dilutions studied, the action being most marked at bromate concentrations of 1:100,000 to 1:200,000. Potassium bromate in concentrations of one part or more in 10,000 appears to exert a slight inhibitive influence upon the digestion of casein by pancreatin, while in higher dilutions (1:200,000 or 1:250,000) it appears to exert a stimulating action."

It would thus appear that in the strength in which it is used in Arkady Yeast Food (1:200,000) potassium bromate may exert a specific stimulating action upon the proteolytic enzyms active in the fermentation.

Some new constituents of milk.—III, A new protein, soluble in alcohol, T. B. OSBORNE and A. J. WAKEMAN (*Jour. Biol. Chem., 33 (1918), No. 2, pp. 243–251*).—The authors, in cooperation with C. S. Leavenworth and O. L. Nolan, give in detail the method of preparation and physical and chemical properties of the alcohol soluble protein of milk previously noted (E. S. R., 38, p. 505). The protein was obtained by concentrating the alcoholic washings from a large quantity of casein which had been several times dissolved in dilute alkali and precipitated by dilute hydrochloric acid. It was soluble in 50 to 70 per cent alcohol but insoluble in absolute alcohol and nearly so in water containing more or less inorganic salts.

The average composition of this protein obtained by a series of fractional precipitations was, on the ash- and moisture-free basis, as follows: Carbon 54.91 per cent, hydrogen 7.17, nitrogen 15.71, sulphur 0.95, phosphorus 0.08, and oxygen (by difference) 21.18. The distribution of nitrogen, according to Hausmann's modified method, was amid nitrogen 1.56 per cent, basic nitrogen 2.55, and humin nitrogen 0.21. The basic amino acids calculated by the Kossel method were, per 100 gm. of milk protein, arginin 2.92 gm., histidin 2.28, lysin 3.98, and tyrosin 2.47.

Compared with casein the alcohol-soluble protein contains more carbon and sulphur and less phosphorus, basic nitrogen, arginin, histidin, and lysin. It does not resemble the alcohol-soluble proteins of vegetable origin in being characterized by a large proportion of amid nitrogen and less lysin than most proteins. Further evidence that it is not related to casein was shown by negative anaphylaxis reactions with casein although it is itself highly anaphylactogenic.

Other characteristic properties are its action as an acid compound, precipitation reaction with potassium ferrocyanid from a solution in dilute acetic acid, strong tryptophane, Millon's and biuret reactions, and solubility in relatively strong alcoholic solutions.

"The possible existence of proteins of similar solubility ought to be considered whenever the complete removal of protein is necessary for the isolation of nonprotein nitrogenous substances of animal origin."

A study of heat-coagulable and water-soluble protein of cow's milk, L. S. PALMER (*Missouri Sta. Bul. 151 (1917), pp. 37, 38*).—In a study of the relation of milk proteins to their filtration through the Pasteur-Chamberland filter it was found that only about 75 per cent as much nitrogen passes through the filter when preserved with chloroform as when preserved with formaldehyde. The total amount which passes through in the presence of either preservative or without any preservative at all does not exceed 25 per cent of the total noncasein nitrogen. The amount of albumin which passes through when formaldehyde is added to the milk was found to be only about 10 per cent of that which may be obtained from the casein filtrate of the original milk when tannic acid is used as the protein precipitant.

The presence of chloroform in milk materially decreased the yield of albumin, especially after it had stood a few days.

In regard to the character of the proteins which invariably remain after the heat-coagulable proteins have been removed, a review of the literature on methods of analysis and the preliminary work indicates that these proteins are merely the residues of albumin and globulin from the original milk which have been sufficiently decomposed during the removal of the casein with the acid to render them noncoagulable by heat and to alter their properties in other ways. No indication was obtained of the presence of proteoses and peptones in milk. It appears that heat coagulation will have to be abandoned as a method determining the albumin of cow's milk.

A study of the dietary essential, water-soluble B, in relation to its solubility and stability toward reagents, E. V. MCCOLLUM and N. SIMMONDS (*Jour. Biol. Chem., 33 (1918), No. 1, pp. 55–89, figs. 12*).—This article reports a series of investigations conducted with the assistance of H. Steenbock, for the purpose of developing a new method of isolating water-soluble B depending upon its solubility in various organic solvents. Experimental data and growth charts are reported and results interpreted. The method was as follows:

Rats were used as experimental animals and were fed a diet of purified food substances complete except that it was free from water-soluble B. Five per cent of butter fat was used to supply an abundance of fat-soluble A. The rats were confined to this mixture for about five weeks until they had become stationary in weight or were declining with evidence of paralysis. The material to be tested for water-soluble B was then added to the diet. The method served to show within two weeks whether a sufficient amount of water-soluble B was in the preparation under investigation.

The authors feel that this method is more satisfactory as a test than is the conventional method of curing polyneuritic pigeons since the element of growth, as well as recovery, is introduced. In this connection, they offer the following alternative explanation for Williams' hypothesis (E. S. R., 36, p. 314) of a specific type of labile isomerism rather than a specific chemical complex in accounting for the curative effects on polyneuritic pigeons of various unrelated substances. "The temporary relief of polyneuritis may be the result of the pharmacological action of certain substances rather than a response with renewed function of cells which have been subjected to a selective fast and

later have been supplied with the missing food complex." Absolute proof that the physiologically active dietary factor is being dealt with should include resumption of growth and maintenance of health.

The experimental data show that the water-soluble B is not extracted directly from beans, wheat germ, or pig kidney by either benzene or acetone, but is readily extracted by alcohol. After being removed by alcohol it is soluble in benzene but very slightly soluble in acetone. That there can be two or more physiologically indispensable substances in water-soluble B the authors feel to be improbable in view of the solubility relations with the three solvents. The water-soluble B is relatively stable toward nitrous acid (an indication that it is neither a primary nor a secondary amin) and toward hydrochloric acid. It is rapidly destroyed by even moderately dilute alkalis, as previously shown by Voegtlin and others (E. S. R., 36, p. 464).

Effect of time of digestion on the hydrolysis of casein in the presence of starch, J. S. McHargue (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 1, pp. 1–7*).—This is a report of experiments conducted at the Kentucky Experiment Station in duplication of the work of Hart and Sure (E. S. R., 37, p. 10) on the effect produced on the hydrolysis of casein by the presence of starch by investigating the effect of varying the time of digestion.

Determinations were made with casein alone and with a mixture of 10 gm. of casein and 50 gm. of starch. The periods of digestion were 12, 15, 24, and 48 hours. The Van Slyke method was followed in detail and the results of the analyses tabulated. From the data the author draws the following conclusions:

"The Van Slyke method for protein analysis, when applied to mixtures of casein and starch in the proportion of 1 : 5, and hydrolyzed from 12 to 15 hours with 20 per cent hydrochloric acid gives results for the amino-acid groups that are comparable with those obtained by Van Slyke upon casein alone. A digestion period of more than 15 hours with 20 per cent hydrochloric acid on a casein-starch mixture brings about a redistribution of the nitrogen contained in the histidin and cystin groups. The insoluble residue obtained from a casein-starch digestion after being thoroughly washed contains nitrogen, which is not seriously affected when distilled with calcium-hydrate suspension, very small amounts being split off as ammonia or remaining in the filtrate. This indicates that the nitrogen is in an inert form and its estimation should not be included in the humin determination."

A foam inhibitor in the Van Slyke amino nitrogen method, H. H. Mitchell and H. C. Eckstein (*Jour. Biol. Chem., 33 (1918), No. 3, pp. 373–375*).—Phenyl ether is reported by the authors to be a very effective foam inhibitor in the Van Slyke nitrous acid method of determining aliphatic amino nitrogen in animal and plant extracts. A convenient procedure for preparing the reagent at comparatively low cost is described.

Nitrogen content of bacterial cells.—I, Method, H. C. Bradley and M. S. Nichols (*Jour. Biol. Chem., 33 (1918), No. 3, pp. 525–529*).—An adaptation of the Folin microchemical method (E. S. R., 29, p. 508) was used for determining the nitrogen content of *Bacillus diphtheriæ* and *B. hoffmanni*. The bacteria were grown on Loeffler's blood serum medium for 72 hours. The growth was then removed by a glass spade with rounded edges, transferred to tared cover slips, and dried in a calcium chlorid desiccator at 37° C. for 72 hours. The weighing was done on an assay balance sensitive to 0.000,005 gm. The digestion material for each tube consisted of 2 gm. potassium sulphate, 0.2 gm. copper sulphate, and 5 gm. concentrated sulphuric acid. The digestion was continued for 15 minutes after the liquid had become colorless. The digest was cooled, made alkaline with sodium hydroxid, and the ammonia aspirated into

tenth-normal sulphuric acid. The nitrogen was determined by nesslerization as in the usual Folin method.

The results showed in *B. diphtheriæ* 8.35 per cent of nitrogen, and in *B. hoffmanni* 9.75 per cent. The authors conclude that "it is possible to determine the nitrogen content of any bacterium which will grow on a solid medium without liquefaction of that medium, by this method, provided as much material as 5 mg. can be obtained."

A study of the nonprotein nitrogen of wheat flour, M. J. Blish (*Jour. Biol. Chem., 33 (1918), No. 3, pp. 551–559*).—The author, at the Montana Experiment Station, has applied the copper protein precipitation method reported by Osborne and Leavenwoth (E. S. R., 37, p. 8) to the separation of protein from nonprotein nitrogen in flour extracts.

It was found that practically a complete separation may be accomplished in water extracts of wheat flour by treating the extract with tenth-normal sodium hydroxid followed by tenth-normal copper sulphate until there is slightly more copper sulphate than an exactly equivalent amount of sodium hydroxid. The author states that the method is simple of manipulation and permits of rapid filtration through ordinary filter paper, giving a clear solution which may be concentrated to one-twentieth its original volume for determinations of amino nitrogen by the Van Slyke micro method and for amid nitrogen determinations. The removal of true proteins is practically complete. Some peptid nitrogen is not precipitated and probably a considerable amount of nonprotein nitrogen which is neither amino-acid nor peptid nitrogen. Normal patent flour was found to contain about 2 mg. of amino-acid nitrogen for every 100 gm. of flour and about three times as much nitrogen in free acid amid form.

The method is thought to be applicable to studies of proteolysis or other studies involving the estimation of protein cleavage products in wheat flour, but probably will not be applicable to biological extracts from other sources than wheat and flour.

Copper-phosphate mixtures as sugar reagents. A qualitative test and a quantitative titration method for sugar in urine, O. Folin and W. S. McEllroy (*Jour. Biol. Chem., 33 (1918), No. 3, pp. 513–519*).—A qualitative test for sugar in the urine, employing alkaline phosphates for holding the copper hydroxid in solution, as suggested in a previous investigation (E. S. R., 36, p. 316), is described as follows:

One hundred gm. of sodium pyrophosphate, 30 gm. of crystallized disodium phosphate, and 50 gm. of anhydrous sodium carbonate are dissolved in about 1 liter of water. To this is added 13 gm. of copper sulphate previously dissolved in 200 cc. of water. The solution is used exactly as is Benedict's reagent for sugar. Minute traces of sugar are indicated by various grades of turbidity, larger amounts by precipitates of cuprous oxid. The test is said to be quite as reliable and sensitive as Benedict's and a trifle more prompt. Unless a marked turbidity is noted in the hot solutions, the result should be regarded as chemically negative.

The authors also describe a practical and inexpensive quantitative method for the titration of sugar in urine. The reagents are an acidified copper sulphate solution containing 60 gm. $CuSO_4.5H_2O$ per liter, and a dry mixture containing 100 gm. disodium phosphate crystals ($HNa_2PO_4.12H_2O$), 60 gm. dry sodium carbonate ($Na_2CO_3.H_2O$), and 30 gm. of sodium or potassium sulphocyanate. The titrations are made in test tubes, which are considered preferable to flasks because (1) the cost of chemicals is reduced, (2) the preliminary heating period is short, (3) there is no necessity of regulating the flame to a definite speed of boiling, (4) the disappearance of the last traces of blue color

is more sharply marked on account of the small volume, and (5) there is little or no return of any blue color at the end of the titration.

By means of a special capillary tip delivering from 45 to 55 drops of urine per cubic centimeter, the titration can be made on undiluted urine with an ordinary burette. The burettes are preferably filled by suction and the titration made by the drop system, starting with 25 drops of urine added to a clear solution obtained by heating 4.5 gm. of the dry salt mixture with 5 cc. of the copper sulphate solution. For accurate results the drops should be delivered not faster than 1 drop per second, and the portion of the burette most used should be calibrated.

The authors recommend for convenience of manipulation and for work involving very small amounts of material special 5 cc. burettes graduated in 0.02 cc. In the case of urines containing albumin, rather large test tubes should be used on account of foaming. The albumin alters the appearance of the cuprous precipitate, but does not change or obscure the end point of the titration.

The determination of lactose in milk, O. FOLIN and W. DENIS (*Jour. Biol. Chem., 33 (1918), No. 3, pp. 521–524*).—The titration method of Folin and McEllroy, noted above, was found by the authors to be applicable to the determination of lactose in milk without preliminary removal of the protein materials. The method of procedure was practically the same as that described in the preceding paper, except that it was found advisable to dilute the milk 1:4 for cow's milk and 1:5 for human milk.

A colorimetric picrate method simpler than the one of Dehn and Hartman[1] was also used. The method is described in detail and a table given of comparative results with human and cow's milk of both the titration and colorimetric methods. Of the two methods, the authors believe the titration to be the more accurate, although the colorimetric method has the advantage that by means of it a large number of determinations can be made more or less simultaneously.

A new microscopic method of counting bacteria adaptable to all grades of raw and pasteurized milk, P. W. ALLEN (*Jour. Infect. Diseases, 22 (1918), No. 3, pp. 245–251, fig. 1*).—The method consists of adding to the milk to be tested a water suspension of aluminum hydroxid which readily collects the bacteria. By centrifuging, the precipitate is thrown down and can be easily separated from the fat, casein, and water. It is dried to a thin microscopic film on a glass slide and stained with methylene blue, for which the hydroxid has slight affinity. A bacterial count is made, using an oil immersion lens.

The method is described in detail and tables of its accuracy reported. From the data the author concludes that about 95 per cent of the bacteria in the average sample of milk appears in the hydroxid thrown down by centrifugalization.

Detection of peanut oil in oils and fats, D. J. DE JONG (*Pharm. Weekbl., 54 (1917), No. 47, pp. 1390–1398; abs. in Chem. Abs., 12 (1918), No. 5, pp. 536, 537*).—From experimental data a comparison is made of the relative value of three methods of detecting peanut oil in commercial oils: (1) That of Jean, recommended in the Dutch Pharmacopœia for testing olive and sesame oils, in which the oil is saponified with alcoholic potassium hydroxid and kept at 18° C., a precipitate appearing within an hour indicating the presence of 10 per cent or more of peanut oil; (2) that of Franz-Adler, previously noted (E. S. R., 30, p. 14); and (3) the solidification point method. The Bellier and Renard-Archbutt methods are also discussed.

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[1] Jour. Amer. Chem. Soc., 36 (1914), No. 2, pp. 403–409.

The authors conclude that for rapidity and accuracy the Franz-Adler method is the best, although it can not be used to detect peanut oil in lard and cottonseed oil. The solidification method is not sensitive enough, as but little difference is shown with large variations in peanut-oil content. In the Renard-Archbutt method 10 per cent of peanut oil can barely be detected.

A study of the solubilities of liquids in liquids. The partition of the lower alcohols between water and cottonseed oil, B. B. Wroth (*[Gettysburg, Pa.]: Author, 1917, pp. 21, fig. 1*).—"The partition ratios of methyl, ethyl, propyl, isobutyl, and isoamyl alcohols between water and cottonseed oil at 25° C. are found to be 103.6, 28.3, 6.41, 1.7, and 0.47, respectively. These are found to change regularly with increased number of carbon atoms. The solubilities of methyl and ethyl alcohols in cottonseed oil are 4.84 and 21.2 gm. per 100 cc. of oil."

A special nomon for calculating the purity of sugar solutions, A. F. Blake (*Internat. Sugar Jour., 20 (1918), No. 230, pp. 73–78, figs. 2*).—The author has constructed a special form of the nomon, previously noted (E. S. R., 38, p. 204), for the rapid determination of the "exponent" of sugar solutions. This exponent is the sucrose percentage of the solid matter and is determined by the following equation:

$$\text{Exponent} = \text{polarization} \times \frac{26}{\text{specific gravity} \times \text{Brix.}}$$

In the special form of nomon a scale has been constructed with the degrees Brix indicated at the point corresponding to the respective values of the factor $\frac{26}{\text{specific gravity} \times \text{Brix.}}$ All data on the regular chart which are not required have been eliminated.

It is the author's intention to work out other applications of the nomon to the numerous calculations of the sugar industry.

Determination of water in sugar factory products by means of the distillation method, T. van der Linden, M. Kauffman, and F. Leistra (*Arch. Suikerindus. Nederland. Indië, 25 (1917), No. 22, pp. 951–962, fig. 1; Meded. Proefstat. Java-Suikerindus., Chem. Ser. No. 8 (1917), pp. 12, fig. 1; abs. in Internat. Sugar Jour., 20 (1918), No. 230, pp. 89, 90*).—The method described consists of distilling 50 gm. of the sample with 350 cc. of xylol. The water is carried over with the distillate and is measured directly in a 250-cc. measuring cylinder graduated to twentieths of a cubic centimeter. The distillation is so regulated that about 100 cc. pass over in three quarters of an hour and 100 cc. more in the next quarter hour, at the end of which time the distillation is stopped. A meniscus correction for xylol and an apparatus correction for the small loss of water have to be made.

The method is considered satisfactory, but requires very careful attention.

Solubility of calcium sulphite in water and in sugar solutions, T. van der Linden (*Rev. in Internat. Sugar Jour., 20 (1918), No. 230, p. 91*).—Previously noted from another source (E. S. R., 36, p. 716).

Preservation of Virginia fruits and vegetables, Edith A. Roberts (*Va. Polytech. Inst. Ext. Bul. 17 (1917), pp. 48, figs. 4*).—In this bulletin, issued in cooperation with the U. S. Department of Agriculture, the author has compiled from various sources extensive material on the different methods of the preservation of fruits and vegetables. A number of recipes and charts for the cold-pack process and for making preserves and catsups, as well as suggestions for the arrangement and equipment for canning by the cold-pack method, are included.

Preservation of unfermented grape juice, S. F. ANDERSON (*Jour. Agr.* [*New Zeal.*], *16* (*1918*), *No. 1*, *pp. 32–36*, *fig. 1*).—The object of this article is to "assist producers in preparing and placing on the market a pure, wholesome, and nonalcoholic vinous juice." The principles involved in the preservation of unfermented grape juice and the methods of operation and utensils required are discussed. The directions are particularly applicable to the output from a small vineyard.

Improvements in methods of pickling olives, F. T. BIOLETTI and W. V. CRUESS (*California Sta. Bul. 289* (*1917*), *pp. 195–200*, *figs. 4*).—This bulletin suggests improved methods for pickling olives, while still adhering to the theory of treatment with lye and oxidation to darken the color. The new methods are subject to better control and are much quicker. They have been used successfully in the laboratory and in some cases in factory tests.

The methods suggested are a combination of continual movement of the liquid with continual aeration, high temperature and circulating liquid, aeration by compressed air with the use of hot standing liquid, and a combination of the three principles of aeration, circulation, and high temperature. The last is considered a very rapid and satisfactory method. Descriptions of the methods and diagrams of the necessary apparatus are given.

The possibility is suggested of subjecting ripe olives to a method of fermentation similar to that used in the preparation of "Queen" olives. Two methods are outlined, in one of which the ripe olives are pickled without exposure to air and then fermented. In the other method olives pickled by the darkening process are fermented. The two methods are said to combine the good qualities and avoid the defects of the present green and ripe olives.

METEOROLOGY.

The meteorological resources of the Empire, H. G. LYONS (*Abs. in Nature* [*London*], *100* (*1918*), *No. 2517*, *pp. 416*, *417*).—Attention is called to the great diversity of meteorological conditions and requirements in the British Empire, the need for better organization and coordination of meteorological agencies, and the necessity for developing an efficient corps of specially trained men for meteorological work.

It is stated that "the work of the meteorologist does not end with recording the pressure, or the temperature, or the monthly amount of the rainfall, but meteorological observations, after being taken, must be worked up into the various forms in which they will be most useful for shipping, agriculture, water supply, engineering, sanitation and health, and now, also, aerial transport. The same form will not suffice for all, and meteorology itself has its own especial needs, but the important thing is that this information, however accurate and detailed it may be, will not be available in exactly the forms that answer to different requirements unless there is a sufficient staff of trained meteorologists to handle it and to supervise its preparation."

Report of the chief of the Weather Bureau, 1917 (*U. S. Dept. Agr., Weather Bur. Rpt.*, *1917*, *pp. 291*, *pls. 7*).—This contains (1) an administrative report summarizing the work of the Weather Bureau during the year, (2) a review of weather conditions during 1916, including also sections giving detailed data on sunshine and excessive rainfall, and (3) monthly and annual summaries of pressure, temperature, precipitation, and related data for 1916, and of monthly and seasonal snowfall for 1916–17. Attention is called particularly to the extension of the activities of the bureau for the time being to two primary projects, namely, "the forecasting of the weather for purely military operations, and the sounding of the upper air for the benefit of aviators, bal-

loonists, and artillerists." Brief statements are made regarding the organization and various activities of the division of agricultural meteorology.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 4 (1917), Nos. 9, pp. 240, pls. 2, figs. 6; 10, pp. 230, pls. 2, figs. 4*).—These volumes contain brief summaries and detailed tabular statements of climatological data for each State for September and October, 1917, respectively.

Meteorological summaries (*Kentucky Sta. Rpt. 1915, pt. 1, pp. 73–75*).—Tables are given which show monthly and annual temperature and precipitation at Lexington, Ky., for 1872 to 1915, inclusive, as well as temperature and precipitation extremes, wind, cloudiness, and casual phenomena for 1915.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER, T. H. REUMAN, and A. L. CHANDLER (*Massachusetts Sta. Met. Buls. 347–348 (1917), pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during November and December, 1917, are presented. The general character of the weather for November is briefly discussed, and the December bulletin gives a summary for the year. The principal data in this summary are as follows:

Pressure, reduced to freezing and sea level (inches).—Maximum, 30.86, December 17; minimum, 28.93, February 5; mean, 30.010. *Air temperature*, in ground shelter (degrees F.).—Maximum, 98.5, July 31; minimum, −22.5, December 30. *Humidity.*—Mean dewpoint, 36.4; mean relative humidity, 78.1. *Precipitation.*—Total rainfall or melted snow, 43.56 in.; number of days on which 0.01 in. or more rain or melted snow fell, 117; total snowfall, 58 in. *Weather.*—Total cloudiness recorded by sun thermometer, 1,770 hours, or 40 per cent; number of clear days, 129. *Bright sunshine.*—Number of hours recorded, 2,684, or 60 per cent. *Wind.*—Prevailing direction, west; total movement, 44,653 miles; maximum daily movement, 611 miles, April 11; minimum daily movement, 1 mile, September 26, November 30; maximum pressure per square foot, 35 lbs., April 10, northwest. *Dates of frost.*—Last, May 18; first, September 11. *Dates of snow.*—Last, April 27; first, November 24.

The climate of Tennessee, R. NUNN (*Resources Tenn., 8 (1918), No. 1, pp. 7–45, figs. 7*).—This article discusses briefly the physiography and soils and crops of Tennessee in their relation to climate, and summarizes in notes, tables, and diagrams the outstanding climatic features (temperature, precipitation, humidity, sunshine, and cloudiness, and length of growing season) of the different sections of the State.

In general the climate of the State is said to range from mild to temperate and is comparatively free from great extremes of temperature, sudden weather changes, and severe storms. The rainfall is abundant but not excessive, the humidity moderate, and sunshine and cloudiness well distributed through the year. The ground rarely covered with snow for more than a few days at a time and the crop-growing season is long as compared with that of the northern and western sections of the United States. The comparatively equable climate of the State is due in part to the fact that it does not lie within any of the principal storm tracks.

Climate and meteorology (*Canada Yearbook, 1916–17, pp. 176–183, fig. 1*).—The characteristic features of the temperature, precipitation, winds, and bright sunshine for the Dominion of Canada during each month of the year 1916 are described, and tables are given which show the temperature and precipitation during 1916 at representative stations in Canada as compared with the normal annual averages for the period from 1888 to 1907, inclusive.

Meteorological records at Ottawa, W. T. Ellis (*Canada Expt. Farms Rpts. 1916, pp. 3, 4*).—Tables based on observations at the Central Experimental Farm, Ottawa, are given showing the maximum, minimum, and mean temperature, the rainfall, snowfall, total precipitation, number of rainy days, heaviest precipitation in 24 hours, and sunshine, for the period from April, 1915, to March, 1916, inclusive, also the annual rainfall, snowfall, and total precipitation from 1890 to 1915–16 with the averages for the period.

The fertilizing value of rain and snow, F. T. Shutt (*Canada Expt. Farms Rpts. 1916, pp. 174–178*).—Data are reported for the ninth year of this investigation (E. S. R., 36, p. 19).

The total precipitation for the year amounted to 33.65 in. as compared with an average of 32.81 in. for the 9 years of the investigation, but the total nitrogen, amounting to 9.765 lbs. per acre, was considerably in excess of that found in any previous year. Of this amount 4.87 lbs. occurred as free and organic ammonia and the remainder as nitrates and nitrites. The cause of the increase has not yet been fully explained.

SOILS—FERTILIZERS.

Soils (*Missouri Sta. Bul. 151 (1917), pp. 55–59, 62–65, figs. 2*).—Brief progress reports are made on various soil fertility experiments as follows:

M. F. Miller and F. L. Duley report further work with corn, the results of which confirm those of previous experiments in showing that "the period from the time of laying by to the time of silking is the most important to final growth from the standpoint of both moisture and nutrition. . . . The water requirement is less influenced by variations of the moisture supply during the growing period than it is by the character of the season. In the case of the variation in moisture supply less concordant results are available than in the case of the variation nutrients."

The results of investigations by M. F. Miller and R. R. Hudelson on the rate and manner of applying fertilizers to corn were adversely affected by the dry season but indicated that heavy applications of fertilizers in the row slightly injured the corn. Applications of fertilizers in the row at the second cultivation gave better results than earlier applications. "The fertilized plats all showed more vigorous early growth than the unfertilized plats."

In tests by Miller and Hudelson on various ways of handling cowpeas as a preliminary crop for wheat there was "very pronounced benefit from the growing of cowpeas between the wheat crops when plowed under, disked in, or when the cowpea crop was taken off. The yields have always been better on the plats in which the peas are disked in and the wheat sown afterward. Rolling after plowing under peas does not seem to be of much help."

In comparative tests by Hudelson of various phosphates in a rotation of corn, wheat, and clover the relative order of effectiveness has been found to be bone meal, calcined phosphate, basic slag, acid phosphate, and rock phosphate.

From studies by W. A. Albrecht of the nitrogen content of soils as affected by storage, the conclusion is drawn that soils absorb ammonia from the air. The increase of nitrogen from this source varied from a few pounds to as much as 1,550 lbs. per acre, while the observed changes in nitrogen content due to bacterial action were within the limits of experimental error. An outline is given of an experiment which has been undertaken on nitrate production in soil as affected by crops and cultivation.

In crop rotation and fertilizer experiments carried on by Miller and Hudelson corn grown continuously has shown a six-year average yield of 11.14 bu. per acre as compared with a yield of 28.52 bu. for corn grown continuously but

receiving 7 tons of manure annually. Corn in rotation yielded 44.2 bu. per acre, and corn in rotation receiving 7 tons of manure annually, 54.55 bu. per acre. Manure has maintained oat and timothy yields better than crop rotation, while wheat grown continuously and manured annually has yielded slightly more than wheat grown continuously and receiving commercial fertilizers. Corn grown in rotation has been maintained at about the same level of yields by heavy applications of manure as by heavy applications of commercial fertilizers. The return from manure has been greater on corn, oats, wheat, and timothy grown continuously than on these crops grown in rotation.

Soil moisture studies by Miller and Duley led to the conclusion that the effects of loosening the soil on increased absorption was more important than that of decreased evaporation.

Cooperative work with the U. S. Department of Agriculture in soil mapping, and with agencies outside the station in soil and crop experiments is briefly noted.

Studies in soil reaction as indicated by the hydrogen electrode, J. K. Plummer (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 1, pp. 19–31*).—This article reports experiments made at the North Carolina Experiment Station with the hydrogen electrode as a means of indicating soil reaction on a number of untreated soils in suspension. "The soils experimented with represent a wide range in texture of those common to the area of the southeastern portion of the United States, extending from and including the Appalachian Mountains to the Atlantic Ocean. The H-ion concentration varies from almost 'true neutrality' to rather excessive 'true acidity' in the soils.

"With the Morgan apparatus for extracting film water from soils [E. S. R., 37, p. 717], it is shown that its reaction is the same as the free water, differing only in intensity.

"The effects of certain fertilizers on the H-ion concentration of long-time-treated plats of three soils have been measured with the following results: (1) Ammonia sulphate has materially increased the H-ion concentration of all plats which have received applications of this material. The acidity thus developed extends often to the subsoil. (2) Sodium nitrate has slightly reduced the acidity of the plats to which it has been applied. (3) Potassium sulphate increases the 'true acidity' when applied to soils, though not as greatly as ammonium sulphate. (4) Acid phosphate does not appear to have affected in either direction the H-ion concentrations of field soils. (5) Lime materially increases the OH-ion concentration of field plats to which it has been added.

"The acidity developed from ammonium sulphate is more intense in the film than in the free water of three soils. Monocalcium phosphate does not change in any way the soil-film water until excessive amounts are added."

Hydrogen-ion concentration measurements of soils of two types: Caribou loam and Washburn loam, L. J. Gillespie and L. A. Hurst (*Soil Sci., 4 (1917), No. 4, pp. 313–319*).—Studies on the hydrogen-ion concentration of Caribou loam and Washburn loam soils from Aroostook County, Me., are reported.

It was found that these soils possess broadly differing biological characteristics before cultivation. "Cultivated soils of the Caribou loam type exhibit, when examined by the colorimetric method, considerably greater hydrogen-ion concentrations than do soils of the Washburn loam type. The average hydrogen-ion exponent for the Caribou loam was found to be 5.2; that of the Washburn loam 5.93. The possibility is indicated that the relative freedom of the Caribou loam from potato scabs may be due to its greater hydrogen-ion concentration."

Soil survey of the San Fernando Valley area, Cal., L. C. Holmes, E. C. Eckmann, G. L. Harrington, J. E. Guernsey, and C. J. Zinn (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1915, pp. 61, pls. 4, fig. 1, map 1*).—This survey, made in cooperation with the University of California, deals with the soils of an area of 175,360 acres, situated in southwestern California, and embraces practically all the San Fernando Valley and a part of the lower mountain slopes and foothills along its margins. Physiographically, the valley, or main portion of the area, is an oval basin. The somewhat regular and smooth side slopes consist of "merging alluvial fans which usually are very sharply differentiated in topography from the hills and mountains flanking their upper sides."

The soils of the area have been broadly grouped in three main provinces with respect to their origin, as follows: "(*a*) Residual soils or those occupying the hills and mountains and derived by weathering in place from consolidated rocks, (*b*) coastal-plain and old valley-filling soils or those derived from unconsolidated yet old, weathered, water-laid deposits, and (*c*) recent-alluvial soils or those of the recent-alluvial fans and valley slopes, this group being by far the most important." The first group is represented by 7 soil types of 4 series, the second by 4 types of 1 series, and the third by 22 types of 4 series. In addition to the above, three miscellaneous classes of material are mapped, namely, rough broken land, rough stony land, and riverwash. Rough stony land, rough broken land, Yolo loam, and Tujunga fine sandy loam predominate, occupying 13.7, 11.4, 8.9, and 6 per cent of the total area, respectively.

Soil survey of Howard County, Md., W. T. Carter, jr., and J. P. D. Hull (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 34, fig. 1, map 1*).—This survey, made in cooperation with the Maryland Geological Survey, deals with the soils of an area of 161,920 acres, located in the central part of the State. Physiographically the county is a thoroughly dissected plateau. The area lies chiefly within the northern division of the Piedmont Plateau, while the southeastern one-sixth of the county lies within the Coastal Plain.

"The soils of Howard County may be classed in three groups, namely, residual soils, formed by the disintegration and decomposition of the underlying rocks of the Piedmont Plateau; soils of the Coastal Plain, derived from sedimentary material deposited on a former ocean bed; and alluvial soils, consisting of recent sediments deposited along the various streams of the county." Thirteen soil types of 10 series are mapped. Chester loam, including the stony phase; Manor loam, micaceous phase; and Congaree silt loam, predominate, occupying 50.5, 18.7, and 10.4 per cent of the area, respectively.

Soil survey of Bottineau County, R. C. Doneghue (*North Dakota Sta. Bul. 124 (1917), pp. 115–148, map 1*).—This survey has been noted (E. S. R., 38, p. 422).

Soil survey of Kay County, Okla., N. M. Kirk and R. C. Jurney (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1915, pp. 40, pl. 1, fig. 1, map 1*).—This survey deals with the soils of an area of 602,240 acres in north-central Oklahoma, lying wholly within the Great Plains region. The topography of the county is level to gently undulating and undulating, the eastern portion being somewhat hilly. Drainage is well established.

The upland soils of the county are mainly residual in origin, being derived from limestone and shale, while some are of eolian origin and were derived from material from the river bottoms. The soils of the first and second bottoms are of alluvial origin. Twenty-eight soil types of 13 series are mapped, Gerald silt loam, occupying 40.3 per cent of the area, predominating.

Further studies of the nature of ammonification, K. Miyake (*Soil Sci., 4 (1917), No. 4, pp. 321–325*).—Further studies on the subject (E. S. R., 36,

p. 513) are reported dealing with ammonification in Caribou silt loam and Washburn silt loam from Maine, Superior clay from Wisconsin, Scottsburg silt loam from Indiana, and soil from the Arlington Farm, Virginia. Leucine and tyrosine were used as the chemicals to be ammonified and were added to 100 gm. of soil in amounts equivalent to 100 mg. of nitrogen.

It was again confirmed that " the process of ammonification is an autocatalytic chemical reaction and that the increase of ammonia in the process is in accordance with the formula: $\text{Log}\frac{x}{A-x}=K(t-t_1)$.

" The total amount of nitrogen added to be ammonified does not transform into the nitrogen in the form of ammonia in the process of ammonification. The amount of nitrogen transformed into ammonia nitrogen is greatly influenced by both the soils and chemical compounds used."

Total nitrogen and carbon in cultivated land and land abandoned to grass and weeds, A. W. Blair and H. C. McLean (*Soil Sci., 4 (1917), No. 4, pp. 283–293, fig. 1*).—" It is pointed out that the average nitrogen content of land which was allowed to run wild from 1908 to 1916, and which during that period received annual applications of dried fish amounting to 600 lbs. per acre, was essentially the same in 1916 as in 1913. (No samples were collected previous to 1913.) The carbon content of this same land was increased slightly during the period 1913 to 1916.

" The average nitrogen content of adjoining cultivated plats, under a 5-year rotation, was 0.02 per cent less in 1913, and 0.023 per cent less in 1916, than the nitrogen content of the corresponding plats that were allowed to run wild. The average nitrogen content of the cultivated plats was slightly less in 1916 than in 1913.

" The average carbon content of the cultivated plats was approximately 0.27 per cent less in 1913 and 0.3 per cent less in 1916 than the average carbon content of the corresponding plats allowed to run wild. The average carbon content of the cultivated soils was slightly less in 1916 than 1913.

" The two cultivated plats which received no nitrogen (the check plats) yielded, in the crops from these plats, an average total of 196.13 lbs. of nitrogen for the 9 years. The six nitrogen-treated plats yielded, during the same period, an average total of 329.94 lbs. of nitrogen in the crops from these plats. There was recovered from the six nitrogen-treated plats for the 9-year period an average of 36.36 per cent of the nitrogen that was applied.

" The percentage of nitrogen and carbon in the cultivated soils is decreasing, even where dried fish is applied at the rate of 600 lbs. per acre annually. The percentage of nitrogen in the soils allowed to run wild, and which have received annual applications of nitrogen, appears to run about constant, but the percentage of carbon is increasing slightly. Much volunteer white clover is appearing on the two plats which receive minerals but no nitrogen."

Loss of organic matter in clover returned to soil, G. E. Boltz and C. J. Schollenberger (*Mo. Bul. Ohio Sta., 2 (1917), No. 12, pp. 397–400*).—Experiments somewhat similar to those previously noted (E. S. R., 36, p. 324) were made to determine the loss of organic matter and nitrogen in a crop of clover subjected to different methods of farm practice. A quantity of dried and finely cut clover amounting to 4 tons per acre was thoroughly mixed with the surface 6 in. of soil of duplicate plats, and the same amount of uncut clover spread upon the surface of each of two other plats after spading, all plats being covered with a wire screen immediately after treatment. The experiment extended over a period of 187 days, and samples of soil, clover, and clover residues were analyzed at the beginning and at the end of the period.

The average loss of carbon from the clover left on the surface was 48.38 per cent, and from that incorporated in the soil 34.26 per cent. A previous experiment showed losses of 66.05 and 28.45 per cent, respectively. No loss of nitrogen was indicated where the clover was incorporated with the soil, and although some nitrogen leached out of the clover applied to the surface of the soil, it was nearly all retained in the soil beneath.

Comparing the results of these experiments with those of previous experiments with manure, it is concluded that, eliminating " the comparatively small amount of fertilizing elements lost in metabolic processes when feeding clover to farm animals, and considering the carbonaceous matter only, there is little to be gained by plowing the crop under, as compared with feeding it and applying the manure. . . .

" While it is advisable to grow cover crops to be plowed under in the spring, in order to conserve the nitrates formed in the autumn and early spring, it is doubtful whether it pays to grow a crop during the summer months for green manuring, except when it could be used to good advantage for feeding purposes and the organic matter returned to the soil in the form of manure."

Decomposition of green and stable manures in soil, R. S. Potter and R. S. Snyder (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 13, pp. 677–698, figs. 9*).—This paper is the third of a series of reports of investigations on this subject made at the Iowa Experiment Station (E. S. R., 38, p. 118).

The conclusions reached from experiments with stable and green manures applied in dry and ground condition are that " lime in the form of a carbonate under the conditions of this experiment appreciably enhances the rate of decomposition of both original soil organic matter and the organic matter of stable manure and the green manures, oats and clover, when added to soil. Two of the more important results of this are the increased availability of plant food and the more rapid depletion of the soil organic matter. This latter effect would be partially and perhaps entirely offset by the fact that with lime larger crops could be grown which would give more organic matter to return to the soil. The green manures, oats and clover, under the conditions of this experiment are decomposed much more completely than stable manure. Clover is decomposed somewhat more rapidly than oats. Stable manure increases the rate of decomposition of green manure when used in connection with the latter. Both stable and green manures act as conservers of lime."

In experiments in which the green manures and stable manure were applied in the fresh condition, the decomposition of the original organic matter in the soil was increased and that of the added manure decreased by liming. The net result, however, was an increased decomposition due to liming.

" The carbon of stable manures is evolved as carbon dioxid from soil under unlimed conditions to the extent of approximately 55 per cent. The carbon of oats under like conditions is evolved to the extent of 79 per cent and that of clover 95 per cent. Under unlimed conditions the amount of stable-manure carbon evolved is only slightly less than under limed conditions, while only about 57 per cent of the carbon of oats and 53 per cent of the carbon of clover is given off under limed conditions. All the manures tended to conserve the lime. Under unlimed conditions stable manure did not increase the rate of decomposition of the green manure as measured by the evolution of the carbon dioxid. With lime there was a slight increase in the amount of carbon given from the green manure when used with the stable manure over that given by the green manure when the latter was used alone. It should be recalled that in the former experiment stable manure enhanced the rate of decomposition of the green manure only to a slight extent. There is not a very great difference

in the rate of decomposition of the green manure when added in a finely ground, dry state and when used fresh and in a relatively coarse state of subdivision."

A bibliography of the subject is given.

Ten wheat fields in "Egypt."—A story in figures, C. G. Hopkins, J. E. Whitchurch and H. F. T. Fahrnkopf (*Illinois Sta. Circ. 208 (1917), pp. 2*).—Wheat grown on poor soil on 10 fields in southern Illinois, where the Illinois system of permanent fertility (E. S. R., 23, p. 17) is practiced, showed an average yield for 1917 of 8 bu. per acre from the land itself and of 20.5 bu. from soil enrichments, such as manure, plant residues, limestone, phosphate rock, and kainit.

Fertilizer experiments, F. T. Shutt (*Canada Expt. Farms Rpts. 1916, pp. 139–169*).—This reports and discusses the results obtained during 1915 in a continuation and extension of systematic experiments with fertilizers in different parts of Canada, previously noted (E. S. R., 36, p. 24). Numerous preliminary tests are in progress to determine the value of Atlantic coast seaweeds as a nitropotassic fertilizer.

The proper season for application of fertilizers to sugi (Cryptomeria japonica) and hinoki (Chamæcyparis obtusa) seedlings and the efficacy of fertilizers, S. Moriya (*Extracts from Bul. Forest Expt. Sta., Tokyo, 1915, pp. 34–41*).—Experiments on loamy soil rich in humus, using ammonium sulphate, sodium nitrate, rapeseed cake, and night soil as nitrogenous manures and sodium phosphate and potassium sulphate, are reported. The total application of nitrogen, phosphoric acid, and potash amounted to 112.5 kg. per hectare (about 100 lbs. per acre).

It is concluded that the fertilizers used are more effective when applied at the proper times than when repeatedly applied at other times. "The efficacy of base manures was especially noted both for sugi and hinoki. . . . The best example of the base manure both for sugi and hinoki is observable. . . . for ammonium sulphate, Chile saltpeter, rapeseed cake, where one-third of the entire quantity was given as base manure in a few days previous to the planting of seedlings, while the rest was given as the top-dressings in two times, viz, in the middle of September and early in May, next year." The best effect was obtained with night soil when the entire quantity was applied before planting. With sugi the second best result was obtained for ammonium sulphate, rapeseed cake, and night soil where one-half of the entire quantity was given at first as base manure, while the rest was given in September, and for Chile saltpeter where the entire quantity was given at four different times, viz, at first as base manure, the beginning of June, the middle of September, and early the next June.

"Among the manures applied ammonium sulphate showed the best results for both trees and rapeseed cake the worst. With sugi, night soil showed better results than Chile saltpeter, but it was just the opposite in the case of hinoki."

The cause of the injurious effect of sulphate of ammonia when used as a fertilizer, R. W. Ruprecht and F. W. Morse (*Massachusetts Sta. Bul. 176 (1917), pp. 119–134, pl. 1*).—In continuation of similar work previously noted (E. S. R., 34, p. 622) the authors describe laboratory investigations with field soils to determine the relations between sulphate of ammonia and salts of aluminium, iron, and manganese, particularly the latter, and pot and water culture tests to ascertain the quantities of these salts which will injure clover seedlings.

Based on the results obtained in these and the former studies, it is concluded that "the positive presence of soluble salts of iron, aluminium, and manganese in soils which have been repeatedly dressed with ammonium sulphate without adding lime; the formation of one or more of these salts in soils that were

extracted with solutions of ammonium sulphate; and the positively injurious action of manganese sulphate, iron sulphate, and aluminium sulphate on seedling plants in water cultures and pot cultures when taken together form a chain of facts which clearly indicates that the injurious effects of sulphate of ammonia, when used freely without the accompaniment of lime, are due to the formation of these soluble salts in the soils of the fields so dressed." Furthermore, it is stated that "in the presence of calcium carbonate, water has removed no observable amounts of aluminium or manganese salts, and bare traces of iron salts, indicating that lime either reacts with the ammonium salt promptly, or subsequently breaks up the salts of aluminium and manganese, and also iron salts, almost completely."

Electrochemical atmospheric nitrogen fixation industry, O. SCARPA (*Ann. Chim. Appl. [Rome], 7 (1917), No. 1–4, pp. 27–87, figs. 25*).—This is a detailed description of the manufacture of nitrates by the direct oxidation of atmospheric nitrogen, the synthetic production of ammonia, and the production of nitric acid by ammonia oxidation.

Method of sale of nitrate of soda to farmers by the United States Government (*U. S. Dept. Agr., Office Sec. Circ. 78 (1918), pp. 11*).—An outline is given of the plan of procedure promulgated by the Secretary of Agriculture for the sale and distribution of nitrate of soda to farmers by the United States Government, under authority of the Food Control Act (E. S. R., 37, p. 303).

Nitrogen from sewage, S. RIDEAL (*Canad. Engin., 32 (1917), No. 7, p. 157; abs. in Chem. Abs., 11 (1917), No. 7, p. 859*).—The author states that an enormous bulk of nitrogen is wasted in sewage and that ammonia may be recovered therefrom by heat or by aeration. If activation is carried on in the presence of lime, it is thought that some ammonia may be recovered with air. The further opinion is expressed that nitrogen may also be recovered from the effluent of sprinkling filters by evaporation in special beds.

Acid phosphate v. raw rock phosphate, C. E. THORNE (*Mo. Bul. Ohio Sta., 2 (1917), No. 12, pp. 390–393*).—The superiority of acid phosphate over raw rock phosphate when applied in equal amounts, both alone and in combination with muriate of potash, lime, or manure, is thought to be fully demonstrated in experiments involving rotations of corn, oats, and clover conducted at Wooster for thirteen years, and of corn, wheat, and clover in progress for 20 years, as indicated by both crop and money returns based on values prevailing up to 1914 and on current values. An experiment recently established involving a rotation of corn, oats, wheat, and clover, and in which 480 lbs. of acid phosphate and 768 lbs. of raw rock phosphate, representing equal money values, are used, in addition to 8 tons of manure, has given the same relative results.

Domestic supplies of potash, E. H. JENKINS (*Connecticut State Sta. Bul. 198 (1917), pp. 45–52*).—The average percentages of potash, phosphoric acid, and in some cases lime and other constituents, are given for Canada hardwood ashes, ashes from household fires, corncobs, brush heaps, brick kilns, witch-hazel stills, brass mills, smokehouses, and seaweeds, and the value of these materials as well as of salt marsh and river-meadow hay and farm manure as sources of potash is discussed.

Emphasizing the importance of saving all the wood ashes from stoves and fireplaces, the author states that "too much can not be said of the value of the 'open fire' in the house, whether in city or country. Aside from its value for heating and ventilation, it should be more used than it is as a 'destructor' for many kinds of wastes, recovering from them the most of what has any value. A hot fire will dry and consume with no annoyance much of the kitchen waste of the day, or if the waste is buried at night in the hot ashes

it will dry and be consumed in the next fire. . . . While the amount of potash in the wastes themselves is relatively very small, the percentage of potash in their ashes is in some cases surprisingly large."

Recent analyses at the station show the following percentages of potash and phosphoric acid in the ashes of certain common vegetable wastes:

Potash and phosphoric acid in the crude ashes of common vegetable wastes.

Kind of vegetable waste.	Potash.	Phosphoric acid.	Kind of vegetable waste.	Potash.	Phosphoric acid.
	Per cent.	*Per cent.*		*Per cent.*	*Per cent.*
Apple pearings	11.74	3.08	Orange skins	27.04	2.90
Banana stalks, yellow	49.40	2.34	Peanut shells	6.45	1.23
Banana stalks, red	46.64	3.04	Potato peelings	27.54	5.18
Banana skins	41.76	3.25	Corncobs	17.25	3.14
Grapefruit skins	30.64	3.58	Cigar ashes	16.81	2.57
Lemon skins	31.00	6.30			

The fertilizing value of some household wastes, P. E. Browning (*Jour. Indus. and Eng. Chem., 9 (1917), No. 11, p. 1043; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 1, p. 42*).—Ash analyses, made in cooperation with J. P. Street of the Connecticut State Experiment Station, are reported. These include those noted in the preceding abstract, except the analysis of red banana stalks and corncobs, as well as the following additional analyses:

Potash and phosphoric acid in the crude ashes of some household wastes.

Kind of vegetable waste.	Potash.	Phosphoric acid.	Kind of vegetable waste.	Potash.	Phosphoric acid.
	Per cent.	*Per cent.*		*Per cent.*	*Per cent.*
Cantaloup rinds	12.21	9.77	Tea leaves	0.44	1.60
Boiled sweet potato skins	13.89	3.29	Dried coffee grounds	.67	.36
Pea pods	9.00	1.79	Lamb chop bone	1.62	26.60
Cucumber skins	27.20	11.28	Egg shells	.29	.43
String bean strings and stems	18.09	4.99	Peach stones	6.04	3.25
			Peach skins	30.76	6.31

Nitrogen determinations are reported in the case of the dried coffee grounds (1.99 per cent), and lime determinations in the case of the lamb chop bone (32.2 per cent) and egg shells (52.12 per cent).

Inspection of commercial fertilizers, H. D. Haskins, L. S. Walker, W. A. Allen, and R. S. Scull (*Massachusetts Sta. Control Ser. Bul. 8 (1917), pp. 64*).—This reports the results of actual and guarantied analyses of 626 official samples of commercial fertilizers and fertilizer materials, representing 418 distinct brands offered for sale in the State and inspected during 1917. The chemical character of the raw materials, mixed fertilizers, and acid phosphates is discussed, and the quality of the nitrogen, phosphoric acid, and potash contained in the fertilizer mixtures indicated.

Fertilizing materials, F. T. Shutt (*Canada Expt. Farms Rpts. 1916, pp. 125–139*).—This reports analyses of limestones and marls from various parts of Canada and of miscellaneous materials, including fertilime, limekiln refuse, calcareous deposits from rivers and lakes, tanbark ashes, stone meal, pond mud, bone char, cotton-mill waste, and starfish.

AGRICULTURAL BOTANY.

Leaf product as an index of growth in soy bean, F. M. Hildebrandt (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 202–205*).—The author emphasizes the statement that the relations established by McLean (E. S. R., 36, p. 809), first, that the leaf product (the sum of the products of length by breadth of all the leaflets on a soy bean plant four weeks old) is approximately proportional to the total leaf area of the plant; and, second, that this leaf area is itself nearly proportional to the total dry weight of stem and leaves, applies generally to the soy bean data obtained at nine different localities in Maryland.

In order to utilize the method proposed by Livingston and McLean (E. S. R., 35, p. 732) of employing the growth rates of standard plants as climatic indices, and in order to keep the plants so utilized alive and uninjured, soy bean leaflets were employed according to methods which are briefly described. As these leaflets are approximately elliptical in form, and as the area of an ellipse is proportional to the product of its axes, the sum of the individual leaflet products of a soy bean plant (the total leaf product for that plant) should be approximately proportional to its total leaf area.

It is noted that this proportion does hold in case of soy bean plants four weeks old. The dry weight of stem and leaves of this plant is found to be approximately proportional to the total leaf area. It is thus possible, by multiplying the proper constant by the leaf area, to calculate the dry weight of the plant. The soy bean may thus prove to be suitable for use as a standard plant for the measurement of climate, as its growth can be determined from easily obtained leaf measurements.

Seasonal variations in the growth rates of buckwheat plants under greenhouse conditions, E. S. Johnston (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 211–217*).—The present study was undertaken with special reference to its applicability in physiological experimentation in plant growth, which may show itself to be subject to puzzling variations due to changing conditions in the greenhouse as the seasons change.

Japanese buckwheat (*Fagopyrum esculentum*) was employed in connection with Shive's three-salt nutritive solution (E. S. R., 34, p. 333; 36, p. 328). A set of similar water cultures was started every two weeks, and each continued for four weeks, so as to allow successive sets to overlap, several different kinds of measurements being made each week.

The data, as tabulated, show the growth rates to vary in general independently from period to period, although increase of weight and increase of area correspond rather closely, both giving high rates for summer and low rates for spring and autumn. So far as these data may be taken as an indication, there is nothing in the usually uncontrolled conditions in a greenhouse in this climate that might be expected to produce a regular march of growth rates in height for buckwheat during spring, summer, and autumn. There is a general agreement between increase of dry weight and of leaf area.

It appears from the considerations as presented and discussed that by employment of such a method as the present one the climatic plant-producing power of any four-week period may be directly compared with that of any other such period at any time or place, the standard plant being used as an automatically integrating instrument for the measurement of the effective climatic conditions, as has been suggested by Livingston and McLean (E. S. R., 35, p. 732; 36, p. 809).

The effect of aeration on the growth of buckwheat in water cultures, E. E. Free (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 198, 199*).—Water cultures of buckwheat in the solution found by Shive (E. S. R., 34, p. 333) to

be the best for that plant were subjected to several gases and to air by different methods.

The cultures supplied with oxygen, nitrogen, and air showed no departure from open controls or cultures sealed in accordance with the method employed by Briggs and Shantz (E. S. R., 25, p. 214), growth rate and dry matter production being essentially the same and practically all the plants setting seed. The degree of aeration of buckwheat appears to be of little influence under such conditions. This point, it is thought, may be of value in general water culture practice. The plants continuously treated with carbon dioxid wilted in a few hours and died in a few days. A test with the admission of air after the first day resulted in a partial recovery, although the plants remained permanently smaller than the controls.

The effect of deficient soil oxygen on the roots of higher plants, B. E. Livingston and E. E. Free (*Johns Hopkins Univ. Circ., n. ser., No. 3* (*1917*), *pp. 182–185*).—During the last three years, experiments have been in progress regarding the oxygen requirement of the isolated and controlled root systems of higher plants, the aerial portions being exposed to the atmosphere.

The response of the root systems apparently differs greatly with the species. The first noticeable effect of oxygen deprivation is an interference with water absorption by the roots, complete cessation occurring in 24 hours in case of *Coleus blumei* and *Heliotropium peruvianum.* Examination of the root systems of injured plants showed them to be dead and in some portions disintegrated. Coleus may be revived and may form a new system of roots, which always starts from the base of the stem. The earliest symptoms of injury appear on plants having the largest root systems. Apparently the crucial condition is limitation of the oxygen supply per unit of root surface or volume.

The evidence suggests that the cause of injury by oxygen exclusion is an interference with the respiration of the protoplasm of the root cells. The success of Salix under deprivation of oxygen raises the question whether the respiration of its roots may not be anaerobic.

The effects of certain mineral poisons on young wheat plants in three-salt nutrient solutions, E. E. Free and S. F. Trelease (*Johns Hopkins Univ. Circ., n. ser., No. 3* (*1917*), *pp. 199–201*).—The authors, having experimented with wheat plantlets in the nutrient solution found by Shive (E. S. R., 34, p. 333) to be the best for the production of dry weight of tops in case of wheat, give the results in tabular form, with discussion.

Most of the elements employed failed to show any stimulating effects. It is suggested that the solution employed is itself slightly toxic because of its high magnesium content. It produces plants showing modifications characteristic of magnesium poisoning, but gives the best yield of dry weight. This, with other observations, suggests that the best production of dry matter by a plant occurs as a result of slight poisoning. Work on the Canada field pea is said to have confirmed this suggestion in some degree. Apparently either magnesium or boron will serve, and it is suggested that other poisons may prove to be as efficacious in this respect.

Symptoms of poisoning by certain elements in Pelargonium and other plants, E. E. Free (*Johns Hopkins Univ. Circ., n. ser., No. 3* (*1917*), *pp. 195–198*).—In tests made by the author regarding symptoms of poisoning shown by *P. zonale* and other plants under the action of poisonous elements in different concentrations, it was found that arsenic, barium, bromin, cobalt, copper, lead, manganese, nickel, silver, uranium, vanadium, and zinc showed no determinable poisonous effect for any concentration with any plant employed. Manganese and zinc slightly improved both color and condition in Pelargonium. Arsenic

in higher concentrations produced a slight but unmistakable stimulation of growth in case of this plant, but it is suggested that this may have been due to a resulting greater availability of the phosphorus or of other soil nutrients. Pronounced and very specific toxic effects followed the use of boron, chromium, iodin, lithium, and mercury, and it is thought that it may be possible to recognize a poisonous ingredient in plants, as in animals, by its effect on the organism.

Certain features of the localization of injury in the plants suggest a relation to transpiration, that is, the poison's being carried into the plant incidentally by the transpiration stream and producing injury only when and where evaporation sufficiently increases concentration in a local tissue area. Chromium may prove to be an exception in this regard.

Sterilization of popcorn, R. O. Brigham (*Rpt. Mich. Acad. Sci., 17 (1915), pp. 190–193*).—Requiring several sterile seeds of popcorn for work in progress on the availability of nitrogen from certain organic compounds in sterile and in inoculated cultures for the growth of plants, the author carried out experimentation from which he concludes that mercuric chlorid, even at very low concentrations and for short durations of time, is toxic to popcorn seedlings, but that sulphuric acid (sp. gr. 1.84) used to treat the seeds for four minutes is the best disinfectant so far tested. While about 90 per cent of the seeds were free from organisms, yet absolute sterility could not be obtained as some fungi probably lie too deep in the seed coat to be reached by the disinfectant.

The presence of ammonia and of ammonium salts in plants, T. Weevers (*Rec. Trav. Bot. Néerland., 13 (1916), No. 2, pp. 63–104*).—Previous study of potassium in plants (E. S. R., 26, p. 823) having led to a similar study of the localization of ammonium, the author gives in considerable detail the results obtained with different plants by the employment of a method, the limitations of which are indicated.

In the phanerogams investigated, free ammonia was found only in the root nodules. Among the cryptogams, it was found in some of the Hymenomycetes (*Clitocybe infundibuliformis*) and lichens (*Peltigera canina*). Ammonium salts were found in all species with the exception of certain forms growing in marshy soils. At a given time of the year, like portions of plants of the same species gave sensibly the same percentages, the influence of habitat appearing to be slight.

A method for approximating sunshine intensity from ocular observations of cloudiness, F. M. Hildebrandt (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 205–208*).—This method, as briefly described, is based upon the assumption that, while solar radiation affects plants in other ways than through its heating effect, by far the greater part of the sunshine energy absorbed by plants is converted into heat (largely as latent heat of the vaporization of water). It seems probable that the total of the other effects produced upon the plant may be more or less proportional to the total energy equivalent of sunshine. The method of measurement of light here described, although only a rough approximation depending upon the heating effect of the sunshine, is said to have given numbers rather definitely correlated with plant growth.

Inventory of seeds and plants imported by the Office of Foreign Seed and Plant Introduction during the period from October 1 to December 31, 1914 (*U. S. Dept. Agr., Bur. Plant Indus. Inventory No. 41 (1917), pp. 67, pls. 4*).—This is an inventory of seeds and plants imported, mostly from Asia, during the period from October 1 to December 31, 1914, about 370 numbers being reported upon.

FIELD CROPS.

[Report of field crops work in Kansas, 1915–16] (*Kansas Sta. Rpt. 1916, pp. 12–14, 32–34, 36–38, 39–42*).—This reports the progress of variety, cultural, and fertilizer tests with grain and forage crops conducted at Manhattan and on the various substations, in continuation of similar work previously noted (E. S. R., 36, p. 131).

An application of 2.5 tons of manure increased the yield of wheat grown continuously 35.2 per cent for a 5-year average, and of alfalfa grown continuously, 80.2 per cent. An annual application of 5 tons increased the average yield of alfalfa 118.1 per cent, and 2.5 tons of manure supplemented by 380 lbs. of rock phosphate, 97.4 per cent. Manure produced higher yields with alfalfa than commercial fertilizers, although the difference was not so great where alfalfa was grown in rotation as where it was grown continuously. Complete commercial fertilizers and potassium sulphate have not proved profitable for any crop.

Corn after corn preceded by alfalfa yielded 70.3 bu. per acre; after wheat preceded by corn, 63.9 bu.; after wheat preceded by cowpeas, 66.2 bu.; and grown continuously, 52.7 bu. Wheat after corn yielded 19.5 bu. per acre; after cowpeas, 15.27 bu.; and grown continuously, 12.75 bu. The highest wheat yields were again obtained from the earliest methods of seed bed preparation. The variations in nitrate nitrogen accumulation in soil following various methods of seed bed preparation appeared to be physical, in the activity of those organisms bringing about cleavage, hydrolysis, or oxidation of native proteins.

P–762, a hard winter wheat, outyielded Turkey and Kharkof by 2.69 and 3.86 bu. per acre, respectively, for a 5-year average. A strain of Red Texas oats produced on the average 3.5 bu. more per acre than the best variety previously grown.

Medium early seeding for oats at the rate of 2.5 bu. per acre, and the seeding of wheat about October 1 with a rate of 6 pk. per acre, were deemed best. Corn grown on plats left uncultivated, but with the weeds removed by hand, gave practically as high yields as that on plats cultivated three times in the ordinary way.

In silage tests, sweet sorghum was first with a yield per acre of 23.6 tons of silage and 21.4 bu. of grain, kafir corn second with 16.6 tons of silage and 54.4 bu. of grain, and commercial white corn third with 15.4 tons of silage and 74.28 bu. of grain. Sudan grass sown on May 15 and June 16 gave average yields of 3.64 and 2.8 tons of cured hay per acre, respectively.

Seeding experiments with wheat at the Fort Hays substation indicated that early seedings should be made at low rates and late seedings at high rates. Of the grain sorghums tested, Dwarf milo was first with a yield of 59.8 bu. per acre. Date-of-planting tests with sorghums for grain and forage showed that kafir corn and feterita did best when planted June 1, while saccharin varieties, such as Freed, Minnesota Amber, and Red Amber grown for forage alone, produced best when planted June 15. The thickest planting rate, 4 in. apart in the row, proved best for both feterita and Red Amber in 1915. The 1914 and 1915 yields showed a decided advantage in favor of close-drilled Red Amber as compared with cultivated rows for hay, while feterita planted in alternate rows yielded only two-thirds as much fodder and grain per acre as was obtained from 4-in. spacings in regular rows. Of 52 varieties of sorghums tested, Red Amber was considered best for forage and Dwarf Yellow milo best as a general-purpose variety. The quality of Sudan grass hay was deemed best when the crop was cut in the full-head stage, and the optimum time for planting was found to be from May 10 to 15. Legumes in Sudan grass mixtures failed entirely in 1914 and 1915. Tunis grass is said to be unsatisfactory. German millet

proved to be superior to other millets for the past three years, but is inferior in both yields and quality to Sudan grass.

Alfalfa tests conducted in the dry uplands since 1903 indicate that only occasional stands can be obtained, although the crop is an unquestioned success on the bottom lands of western Kansas. Annual legumes have not proved profitable either for hay or for seed, but Tepary beans offer some promise.

The highest yields of barley, oats, and spring and winter wheat were again obtained on disked corn ground. Kafir corn and milo maize gave the best results with fall or early spring plowing.

Winter wheat sown on summer-tilled land on the Garden City substation produced the highest yield, 21.3 bu. per acre. Land subsoiled every three years failed to give increased yields over land not subsoiled. Winter wheat sown on disked corn ground produced 16.8 bu. per acre, and that on disked potato ground, 14.8 bu.

The highest yields of spring wheat, 16.1 and 17.4 bu. per acre, were obtained from disked corn land and summer-tilled land, respectively. The highest oat and barley yields, 56.7 and 45.3 bu. per acre, respectively, were obtained on summer-tilled plats. Fall plowing for oats resulted in a yield of 28.8 bu., and spring plowing one of 37.2 bu. Barley yields for these methods amounted to 24.2 and 31.4 bu. per acre, respectively. The highest yields of Dwarf milo were obtained on land listed in the fall, and amounted to 41.9 bu. of grain and 3,900 lbs. of stover per acre, with yields of 38.2 bu. of grain and 3,300 lbs. of stover on fall-plowed land. Spring plowing showed much lower yields.

In variety tests with sorghums for grain, Dwarf Yellow milo was first with 48 bu. per acre. Sumac was first in yield of forage with 17,200 lbs., and Orange second with 15,800 lbs. Kafir corn grown on fall-plowed plants produced 4.3 bu. more grain and 1,309 lbs. more stover per acre than that grown on fall-listed plats. Summer-tilled land produced 45.6 bu. of corn and 4,000 lbs. of stover; spring-listed, 35.6 bu. of grain and 2,500 lbs. of stover; spring-plowed, 33.1 bu. of grain and 2,730 lbs. of stover; fall-plowed, 28.4 bu. of grain and 1,761 lbs. of stover; and subsoiled, 30.5 bu. of grain and 2,970 lbs. of stover. Freed White Dent was first in corn variety tests with a yield of 47 bu. per acre. Kharkof and Turkey Red were the best winter wheat varieties tested, with a yield of approximately 16.5 bu. Marquis and Kubanka, with average yields of 11 and 10.6 bu., respectively, were the highest yielding spring wheat varieties tested. The highest oat yields were 24.4 bu. for Kherson and 20.2 bu. for Red Texas, and from Common Six Row and Common California for barley.

The most profitable yields of cereal crops were obtained with a winter irrigation of 6 in. followed by a second application of from 4 to 6 in. when the wheat was in the boot stage. With forage crops one winter and two summer irrigations, totaling 12 in. of water, are deemed sufficient, while alfalfa was found to require an application for each cutting. The estimated cost and net profit for irrigation where the water must be pumped 130 ft. are indicated for actual field tests with alfalfa, winter wheat, oats, and Sudan grass both for hay and seed.

In corn variety tests on the Colby substation, Freed White Dent, Pride of Saline, Ford County White, and Bloody Butcher, with yields ranging from 42.6 to 39.7 bu. per acre, were highest. Kanred winter wheat yielded 34.25 bu., as compared with 33.66 bu. for local Turkey. Bearded Fife and Black Macaroni spring wheats yielded 30 and 31.4 bu. per acre, respectively. Red Amber sorghum was the only variety to mature good seed in 1915.

Freed White, Red Amber, Black Amber, Dakota Amber, and Minnesota Amber, with yields ranging from 15 to 20 bu. per acre, were the only sorghum varieties to produce grain in 1915 on the Tribune substation. Pink kafir,

Amber and Orange sorghums, and Schrock kafir produced the heaviest yields of forage, ranging from 8 to 5.8 tons per acre. An early prepared seed bed is deemed best for sorghums, while fallow is not regarded as being advantageous. Summer fallow for wheat proved to be the only method to insure a crop, except the partial fallow system or double spaced corn stubble. For summer tillage, a listed fallow is deemed superior to a plowed fallow. Turkey wheat, grown in a rotation with sorghum and fallow produced 22.2 bu. per acre, while other tests of alternate fallow produced yields of only 10 and 5 bu., respectively, for listed and plowed fallows. Nebraska Calico, Cassel White Dent, Moore Calico, Freed White Dent, and Towner White Dent, with yields ranging from 64.4 to 61.2 bu. per acre, were the highest yielding corn varieties tested. Corn on a fallow seed bed produced an average of 31 bu. per acre, and after wheat, 20.4 bu. Sown in rows 84 in. apart, corn has given larger yields than when sown in rows 42 in. apart, in average years, but in 1915 both methods produced an average yield of 27.2 bu. per acre.

Mexican and Tepary beans have each yielded about 8 bu. per acre for three seasons. Of the potato varieties tested, New York Rurals, Pearl, Green Mountain, Triumph, and Irish Cobbler yielded from 73 to 115 bu. per acre in 1915.

Western Orange and Red Amber sorghums are deemed best for forage on the Dodge City substation, while Pink kafir and Yellow milo (when free from chinch bugs) have produced good yields of grain. Western corn varieties have produced an average of 51 bu., and eastern varieties of 35 bu., per acre.

Sudan grass sown in cultivated rows 44 in. apart at the rate of 6 lbs. per acre yielded 400 lbs. of seed per acre. Sown at the rate of 22 lbs. it yields 6,500 lbs. of field-cured hay per acre.

Applications of from 3 to 20 tons of salt per acre have been made upon bindweed-infested areas. A rate of 10 tons is deemed sufficient to kill the weed, provided the small spots where the weed grows up are resalted.

[Report of field crops work at the Missouri Experiment Station, 1916–17], C. A. Helm, J. B. Smith, W. C. Etheridge, E. M. McDonald, and Rachel Holmes (*Missouri Sta. Bul. 151 (1917), pp. 40–44, 62, fig. 1*).—This briefly reports the progress of work continued along the same general lines followed in preceding years (E. S. R., 37, p. 730), embracing cultural and variety tests with soy beans, cowpeas, alfalfa, oats, barley, corn, wheat, and forage crops at various experimental centers in the State.

Of 84 varieties of soy beans tested for seed production at Columbia the highest-yielding varieties were Morse with 28.8 bu., Austin with 28.4 bu., Virginia with 27.2 bu., Mikado with 26.1 bu., and Columbia with 25.6 bu. per acre. At Maryville, Peking, Sable, and Black Beauty were the leading varieties, with yields of 16.9, 15.4, and 14.9 bu. per acre, respectively. At Warrensburg 9 varieties were tested for hay production, the leading varieties with their respective acre yields of cured hay being as follows: Mikado 3.9 tons, Wilson 3.6, and Black Beauty 3.5. Cultural tests at Columbia indicated that better yields of seed and hay were obtained from plantings in 8-in. rows between June 1 and 15, with the seed drilled in at the rate of 42 lbs. per acre.

In variety tests with cowpeas for hay production at Columbia, Groit, Whippoorwill, Clay, Coffee, and Red Ripper were the leading varieties, and at Warrensburg and Maryville, Whippoorwill. In cultural tests at Columbia the largest yields of hay were obtained by drilling in the seed at the rate of 5 pk. per acre in rows 16 in. apart.

Afalfa variety tests indicated a marked superiority of northern-grown seed over southern-grown seed.

The highest-yielding oat varieties at Columbia were Green Russian, Big Four, White Russian, and Kherson, with yields of 30, 28.6, 28.2, and 27.8 bu.

per acre, respectively. At Maryville the leading varieties included Great Dakota with 47.7, Kherson with 46.9, Red Rust Proof with 45.1, and Early Champion with 40.2 bu. per acre. At Warrensburg the fall-plowed oat plats yielded nearly 12 bu. per acre more than either early spring-plowed plats or disked plats. In rate-of-seeding tests the minimum yield, 27.9 bu. per acre was obtained, with a seeding rate of 4 pk. and the maximum yield, 34.6 bu., with a seeding rate of 12 pk. All winter oat varieties winterkilled at Columbia.

Yields of spring barley amounting to 22.7 and 21.5 bu. per acre were obtained at Maryville and Warrensburg, respectively. All varieties of winter barley winterkilled.

The corn variety tests have been reported upon in detail elsewhere (E. S. R., 36, p. 135). Further studies of factors influencing the development of the corn plant, including the effects of competition between corn and soy beans, have been made without arriving at definite conclusions.

It has been concluded from trials with wheat and oats that when seeded in drill rows 3 or 4 in. apart there is no increase in yield over seedings in 6- or 8-in. rows provided the same quantity of seed is used.

In selection work with wheat for the past three years average yields of the original and selected strains have been obtained as follows: Original Fulcaster 35.9 bu. per acre, selected 40.5 bu.; original Early Ripe 31.4 bu., selected 27.3 bu.; and original Poole 31.6 bu., selected 31.8 bu. Leading varieties of wheat in tests conducted at Columbia included Harvest King, with a yield of 23 bu. per acre, Fulcaster 8-y and Mediterranean 30 with 21.4 bu. each, and Fulcaster with 19.3 bu. At Maryville, Mediterranean, Jones Red Wave, Harvest King, and Fulcaster gave the highest yields, amounting to 42.1, 41.4, 37.2, and 36.4 bu. per acre, respectively. Dietz, Fultz, Harvest King, and Fulcaster, with respective acre yields of 26.2, 22.7, 20.8, and 20.5 bu., were highest at Warrensburg.

In tests of forage crops at Columbia Canada field peas alone and mixed with oats proved best for spring-sown forage; mixtures of Amber sorghum and cowpeas, and Kafir corn and sorghum for summer forage; and a mixture of rye and vetch and rye alone for fall sowing. Sudan grass is said to be giving satisfactory results in numerous tests throughout the State.

The seed testing laboratory, conducted in cooperation with the U. S. Department of Agriculture, received 1,723 samples of seed during the year.

[Report of field crops work in New Mexico, 1916–17] (*New Mexico Sta. Rpt. 1917, pp. 28–30, 55–71, figs. 5*).—This reports the results of experiments on the duty of water for alfalfa, irrigation, and cultural tests with potatoes, and miscellaneous crop experiments, in continuation of work previously noted (E. S. R., 37, p. 32).

Six cuttings of alfalfa were harvested during the season, with an average yield of 5.96 tons per acre and an average duty of water of 53.11 acre-inches for irrigations of 2, 3, 4, and 5 in. The highest yield per acre was obtained from the 5-in. irrigation, 6.67 tons, and the lowest from the 2-in. irrigation, 5.3 tons, with duty of water amounting to 61.49 and 42.19 acre-inches, respectively. Additional irrigation experiments with fallow plats and plats sown to alfalfa drilled in and planted in rows to study the relation of soil, water, and crop to irrigation have given results with respect to yield and duty of water comparable to those described above. The data are also said to indicate that 3 in. of water applied at each irrigation to the cropped plats penetrated to a depth of about 3 ft., while 5-in. applications penetrated to about 6 ft. On the fallow plats the water appeared to penetrate to a depth of 10 ft. or over. Root measurements were made, on plats receiving 2 and 5 in. of water, after 2 years' growth, and roots obtained averaging 42 and 57 in. in length, respectively.

Winter irrigations of 10 and 5 in. on potato plats receiving level, ridge, and Greeley cultivation resulted in an average germination of 93 and 87 plants per plat, respectively, as compared with 54 plants for plats receiving no winter irrigation. Winter and summer irrigated Greeley and level culture plats are described as giving satisfactory yields, while the nonirrigated winter or summer plats were very poor. The effect upon yield of potatoes of different methods of irrigation and cultivation and of manure are depicted graphically.

Corn receiving manure has produced an average yield of 46.6 bu. per acre for the two years 1915 and 1916, as compared with a yield of only 17.3 bu. for unmanured. Corn grown in plats irrigated before seeding produced a 3-year average yield for three different varieties of 37.3 bu. per acre and an average stand of 53 per cent, as compared with a yield of 41.2 bu. and a stand of 89.3 per cent for the same varieties grown on plats irrigated after seeding.

Tests of methods of Johnson grass eradication, of Sudan grass and Russian thistle suitability for forage, and of varieties of sugar beets and alfalfa are briefly noted.

In cotton variety tests, the three best varieties were Burnett with 1.47 bales of lint cotton per acre, Durango with 1.46 bales, and Allan Improved Triumph with 1.37 bales.

[Field crops work at the Canada stations and farms in 1915], J. H. Grisdale et al. (*Canada Expt. Farms Rpts. 1916, pp. 108–115, 192–382, 643–647, 701, 702, 704, 705, 721, 722, 733–736, 765–769, 782, 783, 788, 789, 810–813, 817–822, 847–849, 861, 862, 872, 873, 880, 881, 902, 903, 911, 915, 916, 920–926, 952–954, 985, 994, 999–1093, 1129–1134, 1195–1300, 1381–1427, pls. 14*).—A detailed report of variety, fertilizer, and cultural tests with cereal and forage crops, sugar beets, flax, hemp, potatoes, and tobacco in a continuation of similar work previously noted (E. S. R., 36, p. 32). The results obtained are presented in tabular form and briefly discussed.

Variety and cultural tests with winter and spring wheat, oats, barley, field peas, flax for grain and fiber, winter and spring rye, emmer, spelt, buckwheat, vetch, corn for silage, root crops for forage, clover, alfalfa, and miscellaneous legumes and grasses for hay were conducted at the stations, substations, and farms in the Provinces of Ontario, Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Manitoba, Saskatchewan, Alberta, and British Columbia. Rotation and fertilizer tests have been conducted in the same localities, and a rather extensve study made of the cost of production of various field crops. Date-of-planting tests and tests of different sized seed pieces have been made with potatoes, in addition to variety tests. Analyses of standard varieties of sugar beets grown at various centers are also presented.

Variety, cultural, and fertilizer tests with tobacco, and observations on seedbed management and on harvesting and curing the crop conducted in the Provinces of Ontario and Quebec, are described as heretofore. Additional work dealing with a survey of tobacco soils in Canada, and the study of tobacco diseases and of selection and plant breeding work is outlined. The season of 1915 is described as having been absolutely adverse to tobacco growing, although a large increase in the production of bright tobacco in Ontario is reported, due to a more judicious selection of the soils. In fertilizer tests conducted at Farnham (Quebec) the yield with superphosphate was 1,583 lbs. of tobacco per arpent (0.84 acre), as compared with a yield of 1,481 lbs. from basic slag. A fertilizer formula including 250 lbs. of sulphate of ammonia, 150 lbs. of sulphate of potash, and 120 lbs. of superphosphate per arpent is recommended.

Tests in seed-bed management at Harrow (Ontario) indicated that the best results were obtained where fertilizers were applied before steaming the soil.

The root rot disease occurred to some extent in all beds, but is said to have been most prevalent where the greatest amount of fine mold from bush soil had been used, and during cool, unfavorable weather. The Turkish varieties and hybrids appeared to be least affected by the disease, while White Burley was especially susceptible.

Report of the Mandalay Agricultural Station (including Natywagon substation) for the year 1915–16, E. THOMPSTONE and A. M. SAWYER (*Dept. Agr. Burma, Rpt. Mandalay Agr. Sta., 1915–16, pp. 37*).—Rather extensive fertilizer tests, cultural experiments, and hybridization work with rice at the Mandalay station are briefly reported, together with field tests of pigeon peas, wheat, oats, and gram. Field tests with *Phaseolus lunatus* and *P. acutifolius* and selection tests with *P. lunatus*, *Cajanus indicus*, and *Pisum sativum* at the Natywagon substation are also noted.

Report of the Padu Agricultural Station for the year 1915–16, E. THOMPSTONE (*Dept. Agr. Burma, Rpt. Padu Agr. Sta., 1915–16, pp. 11*).—This station was established in 1914 for the purpose of improving the varieties and cultural methods of wheat and gram in this region, to improve the short-staple cottons of the district, and to test new crops and rotations for the poor upland soils. Selection work with wheat and gram and field tests with wheat, gram, cotton, peanuts, sesame, and other native crops are briefly noted.

Driage.—The loss in weight of crops after harvesting, G. EVANS (*Agr. Jour. India, 12 (1917), No. 2, pp. 224–229*).—The author claims that the results reported of crop experiments are often misleading, due to losses in weight of the crops after harvesting, so that they do not always represent the true marketable weight of the crops. He therefore reports a series of experiments with rice, peanuts, *Andropogon sorghum*, *Sesamum indicum*, *Cicer arietinum*, and wheat to determine their loss in weight through drying from time of harvest to time of thrashing.

Light, medium, late, and very late rice showed losses in weight of 11.75, 11.5, 9.5, and 6.5 per cent, respectively, in three days after harvesting. The Big Japanese variety of peanut showed a loss of 43 per cent in 8 days, 41.5 per cent of which occurred in the first 6 days. A smaller Japanese variety showed a loss of 46.5 per cent in 6 days. *A. sorghum* lost approximately 15 per cent in 3 days and more than 22 per cent in two months. The remaining crops showed losses of from 1 to 3 per cent, attributed to the fact that they were harvested dead ripe when the air was very dry and the temperature high, resulting in rapid evaporation. Further experiments are in progress in an effort to arrive at some factor which will allow suitable reductions for driage in the different staple crops.

Grass land and plowed land, R. G. STAPLEDON (*Jour. Bd. Agr. [London], Sup. 17 (1917), pp. IV+5–39; abs. in Nature [London], 99 (1917), No. 2488, p. 373*).—In view of the necessity for increased production of home-grown food the author discusses in some detail the question of grass lands in their relation to food production in Great Britain. Dividing all grass land into (1) permanent grass (fields down to grass 20 years or more), (2) outrun grass composed of senile leys, or outrun permanent grass, and (3) rotations or temporary leys, he proposes improvement through top-dressing, renovating mixtures, altered methods of stocking, substituting pasture for meadow conditions or the reverse, eradication of weeds, and drainage, or through the breaking up of the turf and the conversion of poor grass into rotation land with temporary leys. It is suggested that the number of acres of grass land to be broken annually for a period of years be definitely decided upon in advance, the remaining grass land to be improved by the most appropriate of the methods noted above. The extensive use of basic slag, lime, and wild white clover is urged as fundamental

in stimulating production in districts of low average fertility, together with the selection of suitable mixtures of grasses and clovers for seeding the temporary leys. It is pointed out that the possibility of preparing grass land for rotation during the late spring and summer and in adverse winter weather allows considerable scope for the employment of motor tractors over a greatly extended period of the year aside from the plowing for fall wheat.

Grain production in Nevada, C. S. Knight (*Nevada Sta. Bul. 89* (*1917*), *pp. 3–14. figs. 16*).—Variety tests with wheat, barley, and oats and irrigation experiments with wheat are reported for the period of 1914–1916, inclusive, and cultural methods and field practices described as employed in the production of wheat, and in less detail of barley and oats in Nevada.

Of the wheat varieties tested, White Club, Bluestem, Marquis, Minnesota Fife, and White Australia, with average yields of 58.3, 55.7, 51.6, 48.5, and 45.4 bu. per acre, respectively, are deemed to be especially well adapted to growth under irrigation in the State.

The results of the irrigation experiments, embracing a comparison of 3- and 7-inch applications of water at the 5-leaf, boot, bloom, milk, and dough stages, respectively, and of the omission of one and two irrigations are held to indicate that in every case the 7-inch applications were superior to the 3-inch. The average yield of the 7-inch applications was 24.5 per cent greater than that for the 3-inch applications where one irrigation was omitted, 11.5 per cent greater where two irrigations were omitted, and 9.9 per cent where no irrigations were omitted. The highest average yield, 34.9 bu. per acre, was obtained from 7-inch applications where one irrigation was omitted in the 5-leaf stage. The lowest yields with both 3- and 7-inch applications were obtained when irrigations were omitted at either the boot or bloom stages. The most critical period in the irrigation of wheat is deemed to be between the boot and milk stages of development.

In tests of barley varieties New Zealand produced the highest average yield, 80 bu. per acre, for the two years 1915 and 1916, while Montana Blue Ribbon was highest for the 3-year period of 1914–1916, with 73 bu. per acre. The results of these tests are held to favor the 2-rowed varieties of barley.

Of the oat varieties tested Early Mountain, with an average yield of 81.75 bu. per acre for the 2 years of 1915 and 1916, was the only variety not seriously affected by shattering of the seed due to blasting of the panicles before the plants had matured. Practically 50 per cent of the grain shattered before harvest in most of the varieties tested.

Variety tests with wheat and barley were conducted during 1915 and 1916 in cooperation with the U. S. Department of Agriculture on the experiment farm at Fallon. Little Club, with an average yield of 48.9 bu. per acre, was the highest yielding wheat variety, and Coast, with an average yield of 39.6 bu., the highest yielding barley variety.

[Hybridization studies with spelt and wheat], H. M. Gmelin (*Cultura*, *29* (*1917*), *No. 345, pp. 140–158, pls. 2; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr.*, *8* (*1917*), *No. 9, pp. 1236–1239*).—The author reports and describes crosses of red beardless spelt with velvet chaff Essex wheat, and presents considerable tabulated data relative to the gametic composition of the F_1 generation.

Silage investigations, C. H. Eckles and L. W. Wing (*Missouri Sta. Bul. 151* (*1917*), *pp. 36, 37*).—Results of trials covering a period of four years are held to indicate that excellent silage may be made from any of several legumes provided the material contains approximately 40 per cent dry matter when put into the silo. Legumes cut for hay and containing about 25 per cent dry matter can be raised to 40 per cent by allowing the material to dry in the sun for

four or five hours after cutting. The loss in dry matter in the silage from such sources is said to be about 10 per cent, while in material containing only from 20 to 25 per cent dry matter the loss was more than 20 per cent.

Silage crops for western Washington, E. B. STOOKEY (*Washington Sta., West Wash. Sta. Mo. Bul., 5 (1918), No. 10, pp. 148–152*).—The production and relative value of corn, clover and grass, winter wheat and spring vetch, and spring oats and peas or vetch for silage in western Washington are briefly outlined.

Names of textile plant fibers, L. H. DEWEY (*In The Rubber Industry, London: Internat. Rubber and Allied Trades Ex.* [*1917*], *pp. 341–350*).—The author presents a check list of the principal textile plant fibers and fiber-producing plants, giving the names of the fibers, the common and botanical names of the plants, and the countries of production.

Crotalaria usaramoensis as a green manure, W. M. VAN HELTEN (*Dept. Landb., Nijv. en Handel* [*Dutch East Indies*], *Meded. Cultuurtuin, No. 6 (1917), pp. 3, pl. 1*).—Observations of field tests with *C. usaramoensis* (formerly *C. muyussi*) are briefly noted.

The improvement of the jute crop by pure-line selection, R. S. FINLOW (*Agr. Jour. India, 12 (1917), No. 2, pp. 283–290*).—This is a progress report on the production of improved seed of pure lines of *Corchorus olitorius* and *C. capsularis*, with the view of improving the crop in Bengal.

New grasses for California.—I, Phalaris stenoptera, P. B. KENNEDY (*Univ. Cal. Pubs. Agr. Sci., 3 (1917), No. 1, pp. 24, pls. 8*).—*P. stenoptera* is described and illustrated and its value as a perennial grass, capable of standing the winter temperatures and long, dry seasons in the central valleys of California is discussed.

The after-ripening of cane.—Chemical changes which take place after cutting, J. H. BARNES (*Agr. Jour. India, 12 (1917), No. 2, pp. 200–215*).—Experimental evidence is presented by the author indicating that the custom of storing cut sugar cane before crushing, as practiced in the Gurdaspur District, India, is justified, as it tends to further ripening with a consequent increase in sucrose. It was also observed that the practice was attended with a danger of loss if the storing was continued for too long a period.

The length of time for which cane can be stored without suffering a decrease of sucrose and during which a natural increase may be expected is said to vary with the temperature of the air and the condition of the cane, decreasing with a rise of temperature. Excessive cold, including too great a change in temperature, may cause losses in sucrose, probably due to suspended cell activity and a consequent loss of control of the ordinary fermentation changes occurring in the cell.

The Gurdaspur practice of covering cut cane with damp trash to keep the cane stem alive maintains a uniform temperature with little loss of moisture and, according to the author, should result in a natural increase rather than a decrease in the sucrose content of the cane for a limited time, depending on the temperature and the condition of the cane. It is pointed out that moist heat will also induce the growth of molds, fungi, and bacteria, resulting in decay fermentations and ultimate loss of sucrose.

Considerable tabulated data are presented giving the results of numerous analyses and calculations.

Behavior of sweet potatoes in the ground, H. HASSELBRING (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 1, pp. 9–17, fig. 1*).—Experimental work suggested by the author's previous investigations (E. S. R, 32, p. 633) is described in which the carbohydrate metabolism in Big Stem sweet potatoes grown in a sandy field at Bell Station, Md., was followed in order to determine

whether the quantitative relations between the starch content and sugar content remain constant throughout the latter part of the growing season and to throw some light on the determination of the best time of harvesting the crop. Samples of from 15 to 20 kg. of roots were collected each week from September 18 to November 27, inclusive, and moisture, starch, cane sugar, and reducing sugar determined in duplicate in 5 potatoes of each lot. The results of the analyses are presented in tabular form, illustrated graphically, and briefly discussed. The author also compares his observations with those made by Keitt in South Carolina (E. S. R., 25, p. 534).

It is concluded "that the changes occurring in sweet potatoes in the ground during the latter part of the growing season proceed in a regular and orderly manner. During the later part of the period of growth the composition of the roots remains remarkably uniform, and presents no striking or irregular fluctuations. During this period the root is characterized by a high starch content and a low sugar content. The changes which occur later are associated with the death of the vines. Prominent among these changes is the accumulation of water in the roots as a result of the cessation of transpiration in consequence of the destruction of the leaves. With the termination of the flow of materials from the vines the carbohydrate transformations characteristic of sweet potatoes in storage are inaugurated. These changes consist in the transformation of starch into sugars. In point of time the decrease in starch and the increase in reducing sugar precede somewhat the increase in cane sugar. It appears, therefore, that reducing sugar is formed first as an intermediate step in the change from starch to cane sugar. The loss caused by respiration, which is considerable during the curing process and in storage, is apparently slight in sweet potatoes in the ground. Appreciable destruction of carbohydrates appears not to occur under these conditions until late in the season when the roots have been injured by frosts.

"The changes here described have a practical bearing on the question of maturation of sweet potatoes and on the choice of the time of harvest. . . . It is evident . . . that the choice of time of harvest is not a matter of maturity of the roots, but is governed by other factors. The potatoes may safely be kept in the ground until the leaves have been injured by frost. Of the changes which occur after the destruction of the leaves, the accumulation of water in the roots deserves foremost consideration. It can scarcely be doubted that this increased water content is detrimental to the successful storage of the roots, and causes them to be more subject to decay than roots of normal water content. . . . On this account it is of utmost importance that the harvesting of sweet potatoes be not long delayed after the leaves have been killed by frost. The other changes occurring in sweet potatoes in the ground are essentially the same as the changes occurring in storage. These changes are therefore in no way detrimental to the crop, since no appreciable loss of carbohydrates occurs until the roots have been so severely injured that they have lost their market value."

Tobacco culture in Egypt, V. Mosséri (*Bul. Union Agr. Égypte, 15* (*1917*), *No. 119, pp. 33–73, figs. 2*).—A detailed account of tobacco production under Egyptian conditions.

Structure of the pod and the seed of the Georgia velvet bean, Stizolobium deeringianum, C. V. Piper and J. M. Shull (*U. S. Dept. Agr., Jour. Agr. Research, 11* (*1917*), *No. 13, pp. 673–676, pls. 2*).—The microscopic structure of the pod and seed of *S. deeringianum* is described and illustrated. Since velvet bean meal gives promise of becoming an important commercial feed these structures are deemed important as a basis of identifying the meal either pure, adulterated, or in mixtures.

"In velvet bean meal the most abundant recognizable elements are: (1) The palisade cells of the testa; (2) the sclerenchyma cells of the pod; (3) the hairs of the pod; and (4) an occasional hourglass cell. Most of the fibers are broken, but with careful examination nearly all of the structures may be found. The most important elements to determine that the material is composed of velvet beans are the sclerenchyma cells and the hairs of the pods."

Seed Reporter (*U. S. Dept. Agr., Seed Rptr., 1 (1918), No. 3, pp. 8*).—This number contains the usual statistics and tabulated data on supplies, probable demands, movement, and market conditions of seed stocks, including seed sweet corn for canners, millet, velvet beans, seed potatoes for the South, onion sets (Chicago district), timothy, red and alsike clover, and alfalfa seed shipments, Sudan grass, broom corn, grain and forage sorghums in Kansas, Oklahoma, Texas, and Missouri, imports of forage plant seed permitted entry into the United States, and clover and timothy receipts and shipments for Chicago, Milwaukee, and Toledo markets.

Brief explanatory notes are given on the preliminary garden-seed survey made November 1, 1917, and previously noted (E. S. R., 38, p. 441). An appeal to the corn growers of the United States for cooperation with county, State, and national agencies with respect to needs and supplies of seed corn is made by C. P. Hartley. The development and production of pure Pima (Egyptian long staple) cotton seed by a cooperative cotton growers' association in the Salt River Valley, Ariz., is described by T. H. Kearney.

HORTICULTURE.

[Progress report on horticultural investigations] (*Missouri Sta. Bul. 151 (1917), pp. 46–53, figs. 5*).—In continuation of previous reports (E. S. R., 38, p. 743) concise statements are given of progress made along various lines of horticultural work during the year ended June 30, 1917.

Among the investigations in charge of J. C. Whitten, fruit nutrition studies were continued during the year with strawberries, peaches, and apples. The experimental work with strawberries was limited to applications of lime at the rate of 500 lbs. per acre. The lime was put on during the growing season of 1916. The limed plants developed better foliage and mildew seemed more prevalent on these plants, probably due to the heavier foliage. There was very little difference in yield between the limed and unlimed plats. Data are given on yield of varieties included in the experiment.

The peach crop was almost completely destroyed by the cold winter of 1916. It was shown, however, that the trees receiving nitrogen alone or in combination are more vigorous than trees not so treated. More trees are alive in the nitrogen plats than in the other plats.

A portion of the fertilizer work with apples was discontinued owing to the prevalence of blight, which was more serious on the fertilized trees than on unfertilized. Observations on the yield of apple trees grown from selected buds continued to show no superiority of trees from good parentage over trees from poor parentage. Examinations of buds in winter for forecasting probable bloom again demonstrated that with a little practice and observation one is able to predict very accurately the amount of bloom that a given branch of the tree will produce.

The work of breeding apples for late-blooming habit was continued. Seedlings were grown from previous crosses and a number of new crosses made. In the treatment of apple canker diseases the eradication of apple canker from the horticultural grounds by cleaning out and disinfecting the canker wounds has been highly successful.

A number of asparagus seedlings are being grown in the nursery as a result of intercrossing and selection experiments. The work has thus far shown that the selection of seedlings from intercrossed parents results in securing fine large plants, whereas with seedlings of ordinary stock of some varieties only occasional large plants were secured. So far as can be judged a large number of the seedlings apparently inherit the succulence and desirable qualities of the parents from which they were selected.

Further observations made by C. C. Wiggans on fruit-bud development as influenced by treatment and previous crops bear out previous reports that individual spurs of the varieties under consideration will fruit two years in succession only in exceptional cases. Attempts are being made to determine the amount of stored plant food in the spurs by determining the amount of carbohydrates present. Determinations of reducing sugar, total sugar, and starch indicate that there is no great difference in the amount of these present in bearing and nonbearing spurs. The determinations were made between January and June, 1917, upon spurs of the previous year. Moisture determinations showed that the bearing parts have a slightly higher percentage of moisture than the nonbearing fruit spurs. The water movement from fruiting parts appears to affect the spurs as well as adjacent leaves. The cortex sap from bearing parts was found to be more concentrated than the sap from nonbearing parts. Freezing-point depression tests of sap from parts bearing more than one fruit indicate that there may be some correlation between the number of fruits and depression of the freezing point. Leaf sap and also spur sap from spurs bearing three apples was slightly more concentrated than sap from spurs bearing one apple. In general, the bearing spurs have a smaller number of leaves and the leaves are smaller in size than on similar nonbearing spurs. The total leaf surface of nonbearing spurs averages nearly 50 per cent greater than that of the fruiting spurs.

Further observations were made by J. C. Whitten and C. C. Wiggans on the relative value of fall and spring for planting fruit trees. Fall planting gave the best results, as in previous years. The past year's work emphasizes more fully that root growth does not begin until after the ground freezes on top and shows that late fall planted trees came through the winter in far better condition, making larger growth in the spring than those planted earlier in the fall.

In continuation of previous station studies on the rest period of horticultural plants (E. S. R., 35, p. 221) preliminary investigations were undertaken by W. H. Lawrence with the view of determining greater specific knowledge of the factors influencing the rest period of horticultural plants. An outline is given of the preliminary work undertaken, but no results are presented at this time.

In connection with cooperative spraying experiments conducted under the direction of W. H. Lawrence, numerous complaints have been received relative to the burning of the foliage and the russeting and burning of the fruit. A study was made of several of the combination sprays more commonly employed, with special reference to this trouble. The results indicate that lime-sulphur-arsenate of lead produced fruit of the best keeping quality, had a favorable action on the size, did not have an inhibitive action on the normal coloring of the fruit, produced the smallest percentage of injury known as calyx burn, had the least severe action in russeting the fruit, gave the best results in controlling curculio, and induced the least burning of the leaves and the smallest percentage of defoliation of the tree.

[Report of horticultural investigations] (*New Mexico Sta. Rpt. 1917, pp. 43–51, 55, figs. 2*).—Brief statements of progress made with various horticul-

tural projects, including some data on variety and cultural tests of orchard and small fruits, nuts, and vegetables.

Satisfactory progress was made in the work of improving the native chili (E. S. R., 32, p. 635). In 1916 an acre was planted to No. 9, one of the best varieties developed. The yield amounted to 10,965 lbs. of fresh red chili, or 2,676 lbs. after it was thoroughly dried and sacked.

Report from the division of horticulture for the year ended March 31, 1916, W. T. MACOUN ET AL. (*Canada Expt. Farms Rpts. 1916, pp. 611–642, 647–701, 702–704, 706–721, 722–732, 736–765, 770–781, 783–788, 789–810, 813–817, 823–847, 849–859, 860, 861, 862–871, 874–879, 881–901, 904–910, 912–915, 916–919, 927–952, 955–985, 986–993, 994–997, pls. 9*).—The usual progress report on breeding, cultural, and variety experiments with fruits, vegetables, forest and ornamental trees, shrubs, and annual flowers, conducted at the Central Farm, Ottawa, and at the various branch experimental farms and stations in Canada (E. S. R., 36, p. 39). Most of the experimental work with apples has been recorded in a recent bulletin of the experimental farms (E. S. R., 36, p. 742).

At the Central Farm the yield behavior studies of Wealthy apple trees grown from high-yielding and low-yielding parents failed to corroborate the previous conclusion that the bearing habit of the parent tree had been perpetuated. In 1915 the yield from the progeny of the poorest-yielding parent far exceeded the yield from the progeny of the high-yielding parent.

Orchard-heating experiments were continued during the year. The results secured in conjunction with two previous seasons' results indicate that orchard heaters may well be used for the purpose of preventing frosts in orchards. They are not as satisfactory for protecting ground crops, such as strawberries. A preliminary experiment with cheesecloth covers was conducted with strawberries. By suspending cheesecloth at a foot above the ground differences of from 4 to 6° in night temperature were obtained. The cover was more effective if removed during the day, thus giving the soil a better opportunity to absorb the sunlight.

Data are given on a comparative test of Bordeaux, lime-sulphur, and soluble sulphur with special reference to injury to apple foliage. Bordeaux gave the least amount of injury but only slightly better in this respect than lime-sulphur. Soluble sulphur without the addition of arsenate of lead was not injurious to the foliage or practically so. The burning in every case where soluble sulphur and arsenate of lead were combined was serious.

Orchard spraying experiments conducted at the Kentville experimental station have been noted from another source (E. S. R., 35, p. 447).

Soil management investigations in a young apple orchard, C. G. WOODBURY, H. A. NOYES, and J. OSKAMP (*Indiana Sta. Bul. 205 (1917), pp. 3–52, pls. 2, figs. 10*).—This bulletin gives the results for the first five years of soil management investigations in a young apple orchard which were started in 1910 and will continue until the 1925 crop is harvested. The investigation as a whole has to do with the effects of tillage with cover crop, mulch, and sod on apple trees and the factors responsible for these effects.

The investigation is being conducted largely in a 17-acre upland orchard planted in 1909 to Grimes, Jonathan, and Stayman Winesap apple trees, 35 ft. apart each way. Interplants have been added subsequently for future removal in connection with the study of root development and physiological problems. Similar experimental work is also being conducted on three acres of hillside land, largely to assist in interpreting the results in the upland orchard.

The systems of soil management include four major treatments, namely, clean cultivation with a winter cover crop; a heavy mulch of straw applied to the

trees and the grass cut and let lie; the grass cut and allowed to lie where it falls, no additional mulch given the trees; and the grass cut and raked up to form a mulch collar about the trees. Combinations of these systems of management are also being studied on certain plats. Portions of certain plats are also being fertilized to determine whether lack of any particular fertilizer should be taken into account in interpreting the effects of different systems of soil management. In addition to determination of soil temperatures and soil moisture, physical, chemical, and bacteriological studies are being conducted. The experiment is described in detail, and the results of the different systems of culture, both with reference to the tree and with reference to the soil, are presented in a series of tables and fully discussed.

Among the results thus far secured the authors found that there have been no wide variations in phenological behavior of trees under different systems of soil management, yet there does occur a marked slacking up of growth on grass plats during the dry periods in summer. Trees grown under a clean culture-cover crop system or under a heavy mulch made 44.5 per cent greater average yearly gains in trunk girth than trees grown in grass with a light mulch or no mulch at all. There has been no significant difference between the three varieties in their response to soil management treatments. The Stayman Winesap made slightly greater trunk girth on all plats than either Grimes or Jonathan.

The authors point out that the effect of the various systems of soil management on the soil moisture as observed in this work can not be directly applied in the abstract to the humid region in general. The soil in the experimental orchard has a low organic content and high proportions of silt and clay, thus making it one through which water percolates slowly and one which is easily puddled. In this soil, mulching, either by cultivation or by using a heavy supplemental mulch, maintained the percentage of soil moisture to more than twice that of grassland during the two June droughts of the five years. These soil moisture conditions are closely correlated with the girth increase made by the trees. A study of the precipitation data obtained indicates that the variation in growth due to seasonal moisture conditions has been quite as large as that due to cultural practices.

Data secured in the soil temperature studies do not support the opinion that rains are an important adjunct in warming the soil. The single factor of soil moisture does not appear to have had an influential bearing upon the temperatures existing under the different systems of soil management. The temperature range varies inversely with the amount of mulch covering the soil. As far as this experiment is concerned the rôle of soil temperature within the limits of ordinary cultural practices appears to be a neutral factor in tree growth.

Among the chemical changes induced in the orchard soil by cultural practices during the period 1910 to 1915 it appears that clean cultivation tends to deplete the soil of its organic matter, despite the fact that a cover crop is being turned under each year. Organic matter has slightly increased in the straw mulch plat. The sod plats as a whole have come nearer to holding their own in volatile matter, humus, and nitrogen than the clean culture-cover crop plats. There was no apparent correlation between the amount of volatile matter, humus, and nitrogen in the soil and tree growth.

In most cases more bacteria were present in the sod plats than in the clean culture-cover crop plats. Variations in the amount of mulch on the sod plats have some influence on bacterial numbers. There appears to be no correlation of tree growth and soil moisture with bacterial numbers. Ammonification varied with the season. Differences between plats are not consistent with

seasonal climatic variations, and it is impossible to say that any cultural practice has affected the ammonifying power of the soil.

"Tests show that nitrification varies with the season, but that a growing crop of grass or rye lowers the nitrate content of the soil; that the most nitrates are found under the clean culture-cover crop system, the straw mulch ranking second in amount of nitrates; that the girth gains of the trees are roughly proportional to the nitrate content of the soil; that there is no relation between the nitrifying power of the soil and either cultural practices or tree growth; however, the ratio between the nitrates present in the field and the nitrifying power of the soil does bear a relation to tree growth."

Varieties and culture of cane fruits in western Washington, J. L. Stahl (*Washington Sta., West. Wash. Sta. Mo. Bul., 5 (1918), No. 10, pp. 144–148*).—Popular instructions are given for the culture of raspberries, blackberries, and loganberries, including descriptions of varieties adapted for culture in western Washington.

Shall I plant a garden this year? J. W. Lloyd (*Illinois Sta. Circ. 209 (1918), pp. 4, figs. 2*).—This circular discusses the importance of planning a home garden, gives a list of the station publications dealing with gardening, and presents tentative plans for a suburban garden and a farmer's garden.

Insecticides and fungicides, F. T. Shutt (*Canada Expt. Farms Rpts. 1916, pp. 169–173*).—Analyses are given of samples of lime-sulphur, lead arsenate, calcium arsenate, zinc arsenite, potassium cyanid, tobacco extracts, and a naphthalin preparation received for examination during the year.

FORESTRY.

Forestry and the war, B. E. Fernow (*Jour. Forestry, 16 (1918), No. 2, pp. 149–154*).—A discussion of the relations of the war to forests and forestry, with special reference to the development of future forest policies in America.

An inventory of Florida's forests and the outlook for the future, R. M. Harper (*Bien. Rpt. Dept. Agr. Fla., 14 (1915–16), pt. 2, pp. 194–213, figs. 12*).—An inventory of Florida's forests with reference to their area and density; distribution and character; frequency of fire in different types; composition, including a list of the commonest species; rate of growth and consumption; and influences affecting the future of the forests.

Third biennial report of the State forester of the State of Colorado, W. J. Morrill (*Bien. Rpt. State Forester Colo., 3 (1915–16), pp. 22, figs. 2*).—A progress report on forest protection, investigation, and educational work, including a financial statement for the two-year period ended November 30, 1916. Recommendations relative to future activities are also included.

Results for four years are given on a fence post treating project being conducted in cooperation with the Forest Service of the U. S. Department of Agriculture. Posts of fire-killed alpine fir and lodgepole pine, and of Englemann spruce, cut green and seasoned 12 months, were treated in different ways, principally with water-gas tar creosote from the local gas plant in Fort Collins. The results to date indicate in general that the open-tank method of treatment is far superior to the brush method of treatment and has been highly satisfactory in preserving posts. Immersion in hot water-gas tar for 1 hour and allowing the posts to cool 1⅝ hours in the open tank gave as good results as immersing the posts for 2 hours in the hot water-gas tar and allowing them to cool for 20 hours in the open tank.

The present condition of plantings of some 51 species of trees on the Colorado Agriculture College farm made in the spring of 1905 is indicated, together with data on the present condition of plantings made at later dates with stock

secured from various parts of the United States. In basket-willow experiments that have been under way for several seasons the purple, American green, and Caspian varieties have been particularly successful. Data are also given on the present condition of a number of tree species planted in 1909 and 1910 in shelter-belt plantings at Akron, Washington County, with special reference to determining their adaptability to the windy plains region. The results from this experiment, as a whole, indicate that conifers will prove better than broadleaf species in the nonirrigated region of eastern Colorado.

[Progress report on forestry investigations] (*Missouri Sta. Bul. 151* (*1917*), *p. 45*).—Investigations of the growth and culture of varieties of basket willow for Missouri are being conducted by E. C. Pegg. Observations on the willow holt to date show that the widest spacing yields the fewest rods and gives greatest weight per rod, and the narrowest spacing yields the greatest number of rods with least weight. Generally speaking, the number of rods is greatest from tip cuttings and lowest from butt cuttings.

A third examination was made of fence posts given various preservative treatments and set in November, 1913. "The most perishable woods are the sycamore, basswood, willow, persimmon, cottonwood, birch, dogwood, black oak, red oak, sugar maple, and ironwood. Charring the ends of posts previous to setting them seems to have been successful only in the case of the sycamore. In the case of black ash, redbud, and white elm it hastened the decay. Setting in gravel and with one brush coat of hot carbolineum is of little value in preserving perishable woods. Two coats of creosote lengthens the life of the posts. The open-tank method of treatment confined the fungus attacks to less than 7 per cent of the posts. No failures have yet occurred with posts treated in this manner."

Report of the committee on forestry of the Hawaiian Sugar Planters' Association for the year ended September 30, 1916, L. A. Thurston et al. (*Hawaii. Sugar Planters' Assoc., Rpt. Com. Forestry, 1916, pp. 33*).—This report contains data on tree-planting operations on sugar plantations in the Territory of Hawaii, the working plan adopted by the Board of Agriculture and Forestry for investigating the adaptability of different trees for specific purposes, and reports by plantation managers upon the state of forestry upon their several plantations.

A report upon the present status of forestry in Hawaii by C. S. Judd is also included. Two new forest reserves were created in 1916, bringing the total area of proclaimed forest reserves in the Territory up to 798,344 acres, of which 546,352 acres consist of Government land.

Relation of stimuli to the cone production of western hemlock, R. Watson (*Jour. Forestry, 16* (*1918*), *No. 2, pp. 168–175*).—Observations are given on the effect of various stimuli in promoting seed production in the western hemlock.

The author concludes in brief that "very little is as yet known regarding the factors which influence the seed production of trees. Botanists have shown that the vegetative and reproductive activity of plants may be controlled to a certain extent by controlling the factors which influence the growth of the plant. If the vegetative activities of thrifty western hemlock trees are suddenly checked by injuries, the tree usually is stimulated to reproductive activity. Factors which commonly stimulate the tree thus are injuries by fire and insects, mechanical abrasions, wind-throwing, decapitation, and girdling."

Growth and management of piñon in New Mexico, H. H. Chapman and C. E. Behre (*Jour. Forestry, 16* (*1918*), *No. 2, pp. 215–217*).—On the basis of growth data collected by the junior author on the Santa Fe National Forest, it is concluded in substance that the retention and management of piñon

(*Pinus edulis*) within National Forests as a source of cordwood and mining timbers is justified.

Guide book for the identification of woods used for ties and timbers, A. Koehler (*U. S. Dept. Agr., Forest Serv., 1917, pp. 79, pls. 31, figs. 19*).—This guide book points out the differences which are of practical value in the identification of various species of native woods used for ties and timbers. It is intended primarily for inspectors, but since it includes most of our commercial species it is of value to others interested in the identification of woods. Keys for the identification of the wood, both with and without the aid of a hand lens, are included, together with an appendix on a method of distinguishing long leaf from short leaf and loblolly pine ties or timbers.

Valuation of damages to immature timber, W. N. Sparhawk (*Jour. Forestry, 16 (1918), No. 2, pp. 176–191*).—A comparative discussion of various methods of valuing damage in immature stands of timber.

First-aid manual for field parties, H. W. Barker (*U. S. Dept. Agr., Forest Serv., 1917, pp. 98, figs. 47*).—A first-aid manual similar to that issued by the American Red Cross, and prepared with special reference to its use by field parties of the Department.

DISEASES OF PLANTS.

[Report of the department of] botany, G. M. Reed (*Missouri Sta. Bul. 151 (1917), pp. 30–33*).—Brief accounts are given of investigations conducted by the author on the physiological relation of the powdery mildews to their hosts, forest-tree diseases, a systematic and physiological study of rusts, grain smut and its control, and watermelon diseases found in southeast Missouri. The last investigation was carried on by the author in conjunction with Helen Johann.

The study of the powdery mildews has been largely to determine the susceptibility of oats to powdery mildews. So far no variety of common species of oats has been found entirely resistant to mildew.

The forest-tree disease investigations have consisted largely of collections and studies of forms occurring on different species of trees. In addition a study has been begun of fungi which attack fence posts, observations being made on the durability of fence posts and on the efficiency of different materials used for their preservation.

The watermelon diseases reported upon are said to occur in southeast Missouri, where considerable damage is done to watermelons, cantaloups, and cowpeas. Isolations of strains of Fusarium were made, and infection experiments gave positive results for many of them. It is stated that *F. trichothecioides*, which has never been known to cause watermelon wilt, may in some instances prevent the appearance of seedlings above the ground.

In the study of rusts inoculation experiments with the crown rust of oats were carried out with 49 varieties and species of Avena, practically all proving highly susceptible and only a few showing any evidence of resistance. In conjunction with this experiment oats were tested for mildew, and a striking parallelism was noted between the relation of oat varieties to crown rust and to mildew. Some additional data were obtained regarding the resistance of wheat varieties to the black stem rust and orange-leaf rust.

The grain-smut studies have been carried on to determine the relation of wheat smut (*Tilletia fœtens*) to the date of planting, and in practically every instance the percentage of smut was higher on late planted wheat. Some investigations with the sorghum-kernel smut (*Sphacelotheca sorghi*) were carried on to determine the susceptibility of certain nonsaccharin sorghums. In-

oculation experiments were made with varieties of oats to determine their susceptibility to *Ustilago avenæ* and *U. lævis*, with the result that all the varieties showed some degree of infection, the amount varying from 5 to 20 per cent in most cases. *Avena nuda* was attacked to the extent of 86 per cent.

[Notes on plant diseases] (*New Mexico Sta. Rpt. 1917, pp. 22, 23, 24–26, fig. 1*).—Continued investigations are reported on a disease of chili pepper in which an attempt was made to show the relation of the disease to soil and water factors, but with negative results. A species of Fusarium is reported to have been isolated from diseased plants, but only a small percentage of inoculations made with the organism produced typical signs of the disease.

A brief account is given of a study of root diseases of alfalfa and fruit trees and of a plant disease survey made in the State. In conjunction with the survey, the fungus *Dothichiza populea* is reported as occurring on young poplar trees.

Report from the division of botany, H. T. Güssow et al. (*Canada Expt. Farms Rpts. 1916, pp. 1095–1150, pls. 11, fig. 1*).—This report contains accounts of the work carried on under the destructive insect and pest act, investigations in plant pathology and economic botany, and progress reports on the work at the field laboratories at St. Catharines, Ont., Charlottetown, P. E. I., and Fredericton, N. B.

Considerable regulatory work is reported on potato diseases and white pine blister rust. On the blister rust, an account is given by W. A. McCubbin of the life history of the fungus, *Peridermium strobi*, particularly the overwintering of the fungus on the currant (E. S. R., 37, p. 558.)

In the plant pathology section of the report, accounts are given of investigations on powdery scab, mosaic disease, blackleg, and late blight of potatoes, with descriptions of experiments for their control. Very successful results were obtained by spraying the potatoes with 6 : 4 : 40 Bordeaux mixture in New Brunswick under the direction of G. C. Cunningham and on Prince Edward Island by P. A. Murphy, these men being in charge of the field laboratories in those Provinces.

Notes are given on the effect of wet seasons on grain, especially on the occurrence of sooty ear of wheat due to *Cladosporium herbarum*, a glume spot of wheat caused by *Septoria glumarum*, and wheat scab due to *Gibberella saubinettii;* also on bitter pit of apples, the author agreeing with McAlpine as to its cause, etc. (E. S. R., 37, p. 455).

The investigations in economic botany reported upon consisted principally of studies of the fiber of flax and hemp and work on poisonous plants.

In the reports from the various field laboratories, W. A. McCubbin, of St. Catharines, gives brief accounts of injury to maple trees by squirrels followed by various fungi, the defoliation of sycamores by *Glœosporium nervisequum*, cherry injuries due to frost and to wet soil, winterkilling of strawberry roots, ripe rot of fruits due to *Rhizopus nigricans*, heart rot of peach trees attributed to various polyporous fungi, mosaic disease of tomatoes, etc.; P. A. Murphy, of the Prince Edward Island field laboratory, describes briefly experiments for the control of club root of cabbages and turnips and of various potato diseases and gives an account of work in progress on the growing of seed potatoes in Nova Scotia for planting in Bermuda; and G. C. Cunningham, of the New Brunswick laboratory, reports on the organization of the plant disease work in that Province and on beginning various activities in research and extension.

Annual report of the mycologist, W. J. Dowson (*Dept. Agr. Brit. East Africa Ann. Rpt. 1915–16, pp. 52–56*).—Besides brief mention of experiments in progress on coffee leaf disease, the selection of wheat varieties derived from

crossings made four years previously which have proved resistant to rust, and other matters, the author states that it has not been necessary to spray coffee in the botanic garden since 1914 for the coffee leaf disease (*Hemileia vastatrix*). This disease is easily brought under control by pruning and by one or two applications of any dilute fungicide, after which one spraying each year is sufficient if weeding and pruning are properly attended to. The quarter strength mixtures are not so effective against this fungus on coffee at lower altitudes (such as that at the Government Farm, Kibos). This is probably due to the greater warmth and moisture of the climate.

Citrus (lime, lemon, and orange) trees showed marked improvement after being sprayed with Bordeaux mixture and lime-sulphur after the long rains of 1915. It is also recommended that the latter treatment be continued before the short rains in November.

[Plant diseases, Bombay Presidency], W. Burns (*Ann. Rpt. Dept. Agr. Bombay, 1915–16, p. 69*).—The use of copper sulphate on sugar cane sets, in addition to being harmful to the plants, proves to be ineffective in preventing smut, which may be transmitted through aerial infection also. Red rot is exaggerated by an excess of water. The band disease of betel nut palms, said to be new here and to result in sterility, is under investigation, no fungus or insect having yet been identified as the cause of the trouble. A great increase is noted in the number of these trees sprayed for the koleroga disease of the betel nut palm.

[The effect of defoliation, of gases, and of fungi on plants], R. Ewert (*Ber. K. Lehranst. Obst u. Gartenbau Proskau, 1914, pp. 156–163; Landw. Jahrb., 48 (1915), Ergänzungsb.*).—Removal of blooms from an apple tree 45 years old having been followed the next spring by the production of blooms, the same treatment was tried on a tree 22 years old, with inconclusive results, neither this tree nor its control producing more than a few blooms. Some trees which lost their blooms through attacks of insects are said to have produced a good crop the next year.

Anthracene produced an effect on bush pea and *Polygonum sieboldi* similar to that given by coal-tar vapors.

Leaf cast of apple appeared this year to be independent of the presence of Fusicladium.

A study reported by Killian on the life history of *Venturia inæqualis* is briefly discussed, as is also one by Pietsch on *Trichoseptoria fructigena*, the cause of a rot in quinces and apples.

Normal parasitism and microbiose, V. Galippe (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 4, pp. 162–164*).—The author has given attention to the results of traumatism considered as favoring the development, particularly in fruits but also in animal organisms, of various kinds of the intracellular microscopic fungi and (rarely) yeasts which are normal to them. These have been called microzyms, and, it is claimed, may be caused in different ways (some of which are indicated) to enter upon a developmental phase at the expense of the cells. Microbiose is the name applied to the corresponding intracellular organisms in animals.

Normal parasitism has been studied as developed in apples by the application of pressure or of cold. Normal parasitism and microbiose appear to constitute a general feature of living cells, so that traumatism may develop, in addition, a quasiparasitism without any infection from without or in addition to the latter infection, which may really be a secondary feature of the trouble. This is regarded as having significance in case of wounds from projectiles, which, though absolutely aseptic, may determine an infection by the normal intracellular organisms.

New Japanese fungi.—Notes and translations, I, T. TANAKA (*Mycologia, 9 (1917), No. 3, pp. 167–172*).—This is the first of a series of papers regarding newly discovered fungi or those which have been described only in the Japanese language. Species herein claimed to be new are *Valsa* (*Euvalsa*) *paulowniæ* on Paulownia; *Marsonia carthami* on *Carthamus tinctorius; Mycosphærella hordicola* on wheat and barley; *Scorias capitata, Pestalozzia theæ,* and *Zukalia theæ* on *Thea sinensis;* and *Sclerotinia fagopyri* on *Fagopyrum esculentum.* A new combination proposed is *Ophiochæta* (*Ophiobolus*) *graminis,* now found on rice.

Chemically induced crown galls, E. F. SMITH (*Proc. Nat. Acad. Sci., 3 (1917), No. 4. pp. 312–314*).—The author has continued studies, the main results of which have been previously noted (E. S. R., 36, p. 747), which were intended to determine what by-products of the organism *Bacterium tumefaciens* causally associated with crown gall in plants were the direct cause of the overgrowth. His experiments are said to show that this organism produces in very simple culture media aldehyde, ammonia, amins, alcohol, acetone, acetic acid, formic acid, and probably a little carbon dioxid, most of these substances being identical with those which are said to start growth in unfertilized eggs of the sea urchin. This action is thought to be purely physical; that is, due to the withdrawal of water from neighboring cells by increase of osmotic pressure.

Experiments with all of these products, so far as they have been carried out, gave from young tissues a prompt response in the form of overgrowths, at first with their water dilutions and in later experiments with the vapors merely of these substances. These experiments were successfully made on several plants subject to crown gall, especially on Ricinus, cauliflower, and Lycopersicum. The tumors were small, being caused by only one application of the stimulus. It is thought that the continued application of these substances in very dilute form, comparable to the products of the parasite itself, would produce tumors essentially similar to those from crown gall or bacterial inoculations.

The tumors are either vascularized hyperplasias, mixed hypertrophy and hyperplasia, or simple hypertrophies, their cells being free from chlorophyll, closely compacted, and often 100 times as large as those from which they arose. In the alcohol tumors there was a great increase in the number of cells; that is, a true hyperplasia. Curious vascular displacements and duplications were also obtained, including, in one instance, an entire extra vascular cylinder in the pith of Ricinus.

Small overgrowths on cauliflower leaves have been recently obtained by the use of formaldehyde or formic acid.

Cereal smuts, T. H. SCHØYEN (*Meddel. Statsentomol.* [*Norway*], *No. 8 (1917), pp. 4, fig. 1*).—A brief discussion is given of the treatment of seed grain for protection against cereal smuts with hot water or with formalin.

Truck crop diseases and how to control them, R. E. VAUGHN (*Trans. Ill. Hort. Soc., n. ser., 50 (1916), pp. 329–333*).—This brief discussion includes onion smut, anthracnose, and rots; cabbage blackleg, black rot, clubroot, and yellows; and some account of protective measures.

Experiments on the treatment of Rhizoctonia disease of asparagus, B. T. P. BARKER and C. T. GIMINGHAM (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1916, pp. 39, 40; Jour. Bath and West and South. Counties Soc., 5. ser., 11 (1916–17), pp. 165–167*).—In 1915 diseased asparagus plants from a plantation at Badsey were badly attacked and eventually killed by a soil fungus, *R. violacea asparagi* (*R. medicaginis*), causing a rot of roots and crowns. The soil treatments tested in 1916 showed the best results from 2 oz. bleaching powder per square yard, and from 1 oz. creosote, $\frac{3}{4}$ oz. iron sulphate and 30 oz. lime coming next, and 2 oz. carbolic acid and 2 oz. naphthalin giv-

ing the least marked results. A striking feature of the plat treated with creosote was its relative freedom from weeds throughout the season.

Early and late blight of potatoes—cause and methods of control, J. Woodman (*Trans. Ill. Hort. Soc., n. ser., 50 (1916), pp. 297–310*).—This address deals with the causation and control of both early and late potato blights from the standpoint of the potato grower, also briefly with Rhizoctonia and other influences affecting the potato industry.

Odontia sacchari and O. saccharicola, n. spp., on sugar cane, E. A. Burt (*Ann. Missouri Bot. Gard., 4 (1917), No. 3, pp. 233–236, figs. 2*).—Two new species of Odontia, which have been collected by J. A. Stevenson, in Porto Rico, and which are to be considered by him in a separate paper, are technically described and have been named *O. sacchari* and *O. saccharicola*.

Mosaic disease of tobacco, G. H. Chapman (*Massachusetts Sta. Bul. 175 (1917), pp. 72–117, pls. 5*).—The results are given of several years' investigation on the cause, occurrence, appearance, and methods of control of the well known mosaic disease of tobacco. These experiments were begun in 1907, and some of them have been repeated several times to confirm data regarding certain disputed points. More than usual attention seems to have been given the biochemical phases of the subject.

As a result of the author's experiments, it is believed that the disease is primarily induced by disturbance in the enzym activities and their relation to each other, due to abnormal metabolism and not to any parasite.

A series of experiments were conducted to test the claim of Lodewijks that colored light can diminish or cure mosaic disease (E. S. R., 24, p. 648). The author found that the different colors have little or no effect on the causal agent of the disease; but, in the case of the blue, there is a strong depression of the macroscopic symptoms of the disease.

In connection with the control experiments, it was found that on fields where the mosaic disease is prevalent, the primary infection can usually be traced to the seed bed, and that many healthy seedlings are infected by workmen when setting the plants. It is estimated that about 80 per cent of the infection occurs in this manner. By careful attention to sterilization of seed beds and handling of plants at the time of transplanting, it is believed that a large percentage of infection may be avoided.

A black rot of apples, G. T. Spinks (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1916, pp. 24–26; Jour. Bath and West and South. Counties Soc., 5. ser., 11 (1916–17), pp. 153–155*).—Having followed up the studies previously reported (E. S. R., 36, p. 750), the author describes the type of rot produced by *Monilia fructigena* in mature apples of different varieties, indicating some irregularities which were observed. The mycelium grows chiefly between the cells, but also occurs sometimes within. The kind of rot produced by *M. fructigena* can not yet be correlated with any chemical or physical character of the apple, but it is apparent that the factor which causes the black rot develops only as the apple approaches maturity.

As results of inoculation with *M. cinerea* were rather irregular, further experimentation is considered necessary.

Apple leaf scorch, B. T. P. Barker and C. T. Gimingham (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1916, pp. 41–45; Jour. Bath and West and South. Counties Soc., 5. ser., 11 (1916–17), pp. 167–171*).—A form of leaf scorch of apples, occurring usually during the month of June, with complete freedom of the leaves of the second growth, is described, with discussion of the possible bearings of the various factors. Though the problem is still regarded as unsolved, there is thought to be some ground for the belief that soil moisture and temperature are in some way concerned.

A spot disease of apples, G. T. Spinks (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1916, pp. 27, 28; Jour. Bath and West and South. Counties Soc., 5. ser., 11 (1916-17), pp. 155-157*).—A study of the spot disease of apples, which was prevalent during the winters of 1913 and 1914, and again on some varieties during the winters of 1915 and 1916, has yielded some information regarding the spots, which look alike during the earlier stages, but may later show differences in growth rate, color, and firmness or softness. They may be caused by various fungi which enter through the so-called lenticel some time before a spot appears, so that the actual time of entry is not known. The spot grows rapidly as ripeness approaches. November and December apples, as a rule, can be affected only through points of injury.

A gummosis of apricot, V. Peglion (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 26 (1917), I, No. 12, pp. 637-641*).—An apricot gummosis is described which is said to be due to a Sclerotinia, probably *S. laxa*, highly specialized in regard to apricot. It appears first during the period of blooming, attacking the floral buds, branches, and trunk, and remaining in the mummied fruit which may hang on the trees.

Observations on pear blight in Illinois, F. L. Stevens, W. A. Ruth, G. L. Peltier, and J. R. Malloch (*Trans. Ill. Hort. Soc., n. ser., 50 (1916), pp. 216-227*).—It is stated that conditions in central and southern Illinois favor severe outbreaks of pear blight. It is thought that the use of trees propagated on the more resistant Japanese stock may prove to be of practical value for Illinois growers, the grafts being made preferably on the larger limbs to avoid body cankers.

Apple blight was especially severe in southern Illinois in 1914. A study was made in 1915 of the disease on 10-year-old pear trees and of control measures at Savoy, about 1,000 buds being treated with water suspensions of bacilli applied with a camel's-hair brush, half of these being covered immediately with wet cotton to prevent drying out. No significant difference in degree of infection developed between the treated and the untreated lots. Infections through rapidly growing shoots, especially water sprouts, were numerous during portions of the summer following wet weather in 1915, recent infections being seen as late as August 4. Insect agency appears to be important.

In the early spring of 1916 a few holdover cankers were observed on trunks and larger limbs, giving abundant infective material and spreading the disease throughout the orchard. Kieffer pear trees appeared to be more resistant than Garber, as regards pear blight. No exuding cankers were observed after the pears had bloomed.

Bordeaux mixture applied just as the first flowers were about to bloom controlled completely the blossom infection on Kieffer pear trees and did not interfere with the setting of the fruit. Lime-sulphur spraying, started later, was not quite so effective.

A root rot of black currants, G. T. Spinks (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1916, pp. 29, 30; Jour. Bath and West and South. Counties Soc., 5. ser., 11 (1916-17), pp. 157, 158*).—Observations were made on a 4-year-old plantation of black currants, located on an old orchard site, in which several of the bushes appeared to be dead or dying in 1915 and 1916. A fungus appears to enter the plant near the crown or at the point where the main roots divide and then spread downward to the smaller roots. The fungus has not yet been identified, but is suspected to be of the Armillaria type. Young apple trees on similar areas are attacked apparently by the same fungus, which has not yet yielded any fructifications.

"Reversion" of black currants, A. H. Lees (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1916, pp. 31-34; Jour. Bath and West and South.*

Counties Soc., 5. ser., 11 (1916–17), pp. 158–162).—This trouble is said to have caused extensive loss to the growers of black currants in recent years. It is briefly described according to the characteristics usually displayed. The presence of the bud mite is not considered fully adequate to explain the effects observed.

Grape downy mildew, M. GIRARD (*Vie Agr. et Rurale, 7 (1917), No. 18, pp. 317–319, fig. 1).*—This is a general account of data collected by several persons from the study of grape downy mildew (*Plasmopara viticola*) and of measures for its control.

Sulphur mixtures for treating Oïdium, L. RAVAZ (*Prog. Agr. et Vit., 34 (1917), No. 4, pp. 77–84).*—The author, reporting results of tests of grape varieties, as suggested by the differences in the results obtained by some experimenters, states that the materials usually added (ashes, lime, etc.) have no other value than to dilute the sulphur. This latter may be used in pure form or with admixtures, according to such circumstances as violence of attack, susceptibility of the variety in question, and cost of materials.

Studies on the diseases of the mulberry, G. ARNAUD (*Min. Agr. [France], Ann. Serv. Épiphyties, 3 (1914), pp. 25–30).*—Continuing to report on mulberry diseases (E. S. R., 33, p. 54; 36, p. 751), the author gives an account of the study of mulberry gummosis (*Bacterium mori*) in 1914, as regards the development of the infection, alterations in the leaves, and the incubation period in the branches.

Careful observation has failed to confirm the supposition that aphids (*Aphis evonymi*) are instrumental in the transmission of infection. Hail injury does not appear to be sufficient explanation for all cases. Uninjured leaves do not seem to become infected. The incubation period appears to be long and to depend largely upon weather conditions.

Visit to Upper Rewa to investigate leaf diseases of the banana, C. H. KNOWLES (*Dept. Agr. Fiji Pamphlet 24 (1916), pp. 5).*—Bananas in the areas visited appear to be affected by leaf-spotting fungi, of which *Cercospora musæ* and another fungus, probably a Dothidella, are mentioned.

Walnut diseases, P. PARMENTIER (*Vie Agr. et Rurale, 7 (1917), No. 22, pp. 393–396, figs. 6).*—The author lists with brief discussion parasitic animals and plants and nonparasitic injurious influences affecting the walnut.

Dying of young pines in circles about ant hills, F. W. HAASIS (*Jour. Forestry, 15 (1917), No. 6, pp. 763–771, figs. 5).*—Having made a collection of data since 1915 on the dying of young pines around ant hills in the 1908 plantations at Portland, Conn., the author states that the phenomenon is associated usually, but not always, with ant hills, both *Formica exsectoides* and *F. fusca subsericea* being noted in this connection. The trouble, which occurs in both plantations and wild stands, is usually associated with fungus and scolytid infestations, 9 species of fungi having been isolated from the diseased areas. The trouble probably originates at a lenticel. Negative results were sometimes obtained from bark inoculations. The ants are thought to be instrumental in the spread of the disease. The infection appears to be primary.

Summary of blister rust situation in Massachusetts, H. T. FERNALD (*Mass. Forestry Assoc. Bul. 119 (1916), pp. 23–25, fig. 1).*—In the spring of 1915, the white pine blister rust was known in only a few localities in Essex County and the central and western portion of the State. In the fall of that year, the organism was found on currants and pines in Berkshire County. Federal and State scout work showed that Ribes was diseased in 205 towns of the State and pine of all ages in about 45 towns. Removal of Ribes on a large scale is noted.

White pine blister rust (*Rpt. Min. Lands, Forests and Mines, Ontario, 1916, pp. 147–149, pl. 1*).—A summary is given of the status of white pine blister rust as it now exists in Ontario. A large number of infections of white pine are reported to have been found in the Niagara Peninsula, especially in Pelham, Thorold, and Grimsby townships, many being found on native pine. The disease appears to have become firmly established and presents a serious problem owing to the prevalence of both currants and white pine.

Pure cultures of wood-rotting fungi on artificial media, W. H. Long and R. M. Harsch (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 2, pp. 33–82*).—The authors describe a method by which it is claimed that various wood-rotting fungi can be differentiated from each other by their cultural characters alone when grown upon artificial media, also a method by which the fruiting bodies or sporophores of wood-rotting fungi can be produced from pure cultures on artificial media. It is claimed that when cultural characters of closely related but really distinct species are compared, marked and constant differences in the character of the mycelium will be found on certain corresponding agars in the series of cultures representing the two species, while if the fungi are really of the same species, no constant differences will occur.

Basing the conclusion on these facts, the authors state that unknown rots can be identified by making pure cultures of the causative organisms from diseased wood.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Birds of America, edited by T. G. Pearson et al. (*New York: The University Society, Inc., 1917, vols. 1, pp. XVIII+272, pls. 40, figs. 213; 2, pp. XIV+271, pls. 37, figs. 197; 3, pp. XVIII+289, pls. 34, figs. 182*).—These volumes, which comprise 1 to 3 of the Nature Lovers Library, contain precise and fairly complete descriptions of the external physical appearance of about 1,000 species and subspecies of American birds, based for the most part on Ridgway's Birds of North and Middle America (E. S. R., 30, p. 851) ; popular characterizations, or life histories, of the species with especial regard for portraying their interesting and distinctive traits; and data on the actual usefulness of birds based on publications of the Bureau of Biological Survey of the U. S. Department of Agriculture. Under each species a technical description is given for the use of the more experienced observer, which includes common names, general description, color, nest and eggs, and distribution. This is followed by a popular account in large type intended particularly for the layman. The descriptions of birds not included in parts 1 to 7 of Ridgway's work were written by R. I. Brasher. The order in which the birds are arranged is that followed in the check-list of American Ornithologists' Union.

Volume 2 contains an article by E. H. Forbush on Out-Door Bird Study (pp. V–XIV) and volume 3 an article by W. W. Cooke on Bird Migration (pp. V–XVIII). Color keys to water birds, land birds, and to warblers; a glossary of technical terms; a bibliography; and an index to the three volumes are appended to volume 3.

Mammals of America, edited by H. E. Anthony et al. (*New York: The University Society, Inc., 1917, vol. 4, pp. XXII+335, pls. 6, figs. 224*).—This volume on American mammals is the fourth of the Nature Lovers Library. A paper on American Game Protection (pp. XV–XXII) by T. S. Palmer, of the Bureau of Biological Survey of the U. S. Department of Agriculture, is followed by technical descriptions of the species, under each of which is given (1) the animal's scientific name, (2) other names, (3) general description, (4) dental formula, (5) pelage, (6) measurements, (7) range, (8) food, (9) general

remarks, and (10) related species. A glossary of technical terms, a bibliography, and an index are included.

Gophercides, F. T. SHUTT (*Canada Expt. Farms Rpts. 1916, pp. 173, 174*).—This is a report of analyses made of prepared gopher poisons that were found on the market in northwestern Canada. Inquiries made among those who have had experience in gopher poisoning indicate that the proprietary preparations are being discarded in favor of home-prepared baits, using strychnine or strychnine sulphate as the poison.

The wild rats of the Southern States as carriers of Spirochæta icterohæmorrhagiæ, J. W. JOBLING and A. A. EGGSTEIN (*Jour. Amer. Med. Assoc., 69 (1917), No. 21, p. 1787*).—Ten per cent of more than 100 rats collected in Nashville, Tenn., harbored *S. icterohæmorrhagiæ*. The rats were obtained from different parts of the city, and so far as could be determined the various localities gave about the same proportion of infected animals. An account of the occurrence of this spirochete in wild rats by Noguchi has been previously noted (E. S. R., 37, p. 577).

[Report on entomological work] (*Kansas Sta. Rpt. 1916, pp. 15, 16, 18, 19*).—Brief statements are made of the status of investigations of the Hessian fly, corn ear-worm, fruit insects, grasshoppers, chinch bug egg parasites (in which the average percentage of parasitism during the year was 12.9), climate and injurious insects, etc.

Entomology (*Missouri Sta. Bul. 151 (1917), pp. 38, 39*).—Brief statements of the work of the year are made by L. Haseman and K. C. Sullivan of an investigation of the insects injurious to nursery stock in the State; by A. H. Hollinger on the scale insects of Missouri; and by L. Haseman on injurious insect pests of melon and related crops, on the causes of the periodical outbreaks of insect pests, and on the annual cycle of the Hessian fly in Missouri and its control.

In control work with the San José scale on nursery stock, hydrocyanic acid gas destroyed from 97 to 98 per cent of living scale and a miscible oil dip destroyed from 99 to 100 per cent. It is stated that 13 new species of scale insects have been found in the State during the year and 9 additional genera recorded.

[Entomological work] (*New Mexico Sta. Rpt. 1917, pp. 23, 24, 26, 27, 51–55, fig. 1*).—Brief statements are made of the work of the year with the San José scale, harlequin cabbage bug, and other injurious insects, including a leaf miner (*Agromyza scutellata*) which did considerable damage to early potatoes and beans in the spring of 1917. Data relating to life history studies of the codling moth are briefly considered and a spraying calendar for its control on apples and pears for 1917 is presented.

[Economic insects in Yakima County, Wash.] (*Ann. Rpt. Hort. Dept. Yakima County, Wash., 1916, pp. 6–9, 19–25, 38–72, figs. 2*).—The accounts here given by De Sellem relate to the occurrence of and control work with the more important pests of horticultural crops during the year (pp. 6–9: codling moth investigations and determination of spray dates (pp. 19–22); summary of data on codling moth control for the season of 1916 (pp. 23–25); codling moth investigations (pp. 38–52); codling moth breeding work, season of 1916 (pp. 53–61); and nicotin sulphate for codling moth control (pp. 62–72). The Colorado potato beetle made its appearance in the Yakima Valley, near Sunnyside, in 1916 for the first time and its eradication was attempted.

"The work during 1915 and 1916 indicates that nicotin sulphate acts as a material check to the work of the codling moth. At the present prices of nicotin it would not be advisable to substitute nicotin sulphate for arsenate of lead

in codling moth control alone, but where aphis and sucking insects are to be controlled the omission of lead will result in a considerable saving."

In the experiments here reported, "when nicotin sulphate and arsenate of lead have been used side by side the former has proved as efficient as the lead in codling moth control and has kept the trees free from all sucking insects. Trees sprayed with nicotin sulphate showed much higher percentages of extra fancy and fancy fruit than the trees sprayed with lead. The fruit was more highly colored. Observations during the seasons of 1915 and 1916 indicate that the nicotin acts as a material check to the spread of San José scale. In the nicotin sprays the addition of soap is advisable. It does not seem necessary to use nicotin stronger than 1:800 for colding moth and 1:1,024 has given nearly as good results."

[Economic insects in France] (*Bul. Soc. Path. Veg. France, 4 (1917), No. 1, pp. 8–18, 41, 45–47*).—Among the papers here presented relating to economic entomology are Notes on a Bacterial Disease of the Vine Pyralid, by G. Daumézon (pp. 8–10); Carabids Injurious to the Strawberry Plant, by P. Lesne (pp. 11–15); Concerning a Claim of Priority Relating to *Asterolecanium variolosum* (*A. quercicola*), by G. Arnaud (pp. 16–18); on *Cynips calicis*, by P. Marchal (p. 41), and The Anthonomes, by A. L. Clément (pp. 45–47).

War on greenhouse pests, H. A. Gossard (*Mo. Bul. Ohio Sta., 2 (1917), No. 12, pp. 394–396*).—This is brief popular summary of information on plant lice and white fly and the manner in which they may be controlled.

Potato plant lice and their control, W. S. Regan (*Massachusetts Sta. Bul. 177 (1917), pp. 135–146*).—This is a report of investigations made during the course of the serious outbreak of the potato plant louse (*Macrosiphum solanifolii*) in Massachusetts in 1917. Their injury to potato plants became evident during the second week in July and rapidly increased in severity until the latter part of the month and early August, when no progressive injury could be noticed and an examination of previously badly infested fields showed them to be present only in very small numbers or in numbers insufficient to cause further material injury during the season. Thus it appears that there was a period of from three to four weeks when the plant lice were dangerously prevalent upon potato plants, and the author's observations on this point were substantiated by reports from other sections and the past history of its outbreaks. During the outbreak the potato fields showed injury varying from slight to complete destruction of the plants, some patches being completely free from infestation while others near by were badly injured or destroyed before insecticides could be applied. Migration to the winter hosts in Massachusetts appears to take place to some extent during the latter part of July, but mainly during August.

Spraying experiments were conducted with a number of contact insecticides, several of which (blackleaf 40, 1:800; Nicofume liquid, 1:750, with soap; fish-oil soap, 1:6) destroyed from 98 to 100 per cent of the plant lice without injuring the plants. The results obtained have led the author to conclude that the pest can be readily controlled by the use of blackleaf 40 or similar nicotin preparation at the rate of 1 part to 800 parts of water, with the addition of common laundry soap, dissolved in boiling water, at the rate of 2 lbs. to 50 gal. of the diluted blackleaf 40 solution. One application properly applied to the underside of the foliage when the infestation is severe enough to cause evident wilting of the leaves can in most cases be made economically and to advantage. Fish-oil or whale-oil soap at the rate of 1 lb. to 6 gal. of water is about equally as effective. It is pointed out that blackleaf 40 can be combined safely with Pyrox, Bordo-lead, Bordeaux mixture, or arsenate of lead, but that when these are added soap should be omitted. Kerosene emulsion is not highly effective against potato plant lice and the labor involved in preparing it is also against

its use. Tests of miscible or soluble oils seem to indicate that these materials are dangerous to use upon potato foliage. Lime-sulphur is ineffective, even at double the ordinary strength used upon foliage.

The advisability of applying treatment in the control of this pest depends upon the severity of the infestation, its seasonal importance, accessibility, available apparatus, etc. If injury to the plants has not been severe enough to kill portions of the tops of the plants to an evident extent before the first of August, it is probable that the injury likely to be done will not exceed the cost of applying treatment. When severe injury is noticeable before the first of August, a thorough treatment should be made at once. "The destruction by burning of potato vines after harvest, together with all weeds and other refuse about gardens and potato fields, unless such material is composted; the burning over of grassy and weedy fields in the vicinity of potato patches in the late fall or early spring; and late fall plowing of gardens are methods of clean culture which may materially reduce future infestation. Injury by potato lice renders the plants more susceptible to 'blight' and should emphasize the need for frequent sprays with Bordeaux mixture." In order to be effective the spraying outfit should include an extension rod with an underspray nozzle set at a right angle to the rod, in order that the underside of the leaves may be readily reached by the spray.

Brief mention is made of natural agents of control.

A report of investigations conducted in Ohio by Houser during 1917 has been previously noted (E. S. R., 38, p. 462).

The eye-spotted bud-moth (Tmetocera ocellana), E. M. DuPorte (*Ann. Rpt. Quebec Soc. Protec. Plants* [*etc.*], *9* (*1916–17*), *pp. 118–137, figs. 17*).—Studies of the biology of the eye-spotted bud-moth and means for its control, made during the seasons of 1914, 1915, and 1916 in the Province of Quebec, chiefly on the island of Montreal, are reported.

The apple, pear, plum, cherry, quince, peach, blackberry, and laurel oak are recorded as food plants of this species in America. The author has taken it in Quebec on all these except quince, peach, blackberry, and laurel oak, and in addition on Cratægus and an ornamental flowering crab. A marked preference is shown for the apple.

There is but one brood each year, but the larvæ live throughout a portion of two seasons, and the injury done by the young larvæ in the summer and fall differs from that done by the older larvæ in the following spring. The latter part of April or early May the caterpillars become active and injure the leaf buds, flower buds, leaves, setting fruit, and sometimes the young twigs. In one orchard in which the infestation was comparatively light, 18 per cent of the flowers were destroyed. In Nova Scotia injury to the extent of 59.56 per cent of the blossoms is recorded, and in unsprayed orchards in Quebec the author found evidence of injury to more than 50 per cent of the fruit buds.

Pupation on the twig commences the first week in June, and 11 or 12 days pass before the adults emerge. The young caterpillar, which hatches out at the end of June or in July, immediately begins feeding on the underside of the leaf, where it makes tiny excavations in the tissue. The injury caused by its skeletonizing the leaves in summer may be more or less negligible, but more important direct injury is caused when the insect attaches a leaf to a fruit, feeding between the two and injuring the surface of the fruit. Usually in Quebec the first adults begin to appear about June 20, their emergence continuing for about 4 weeks. Mating may take place and oviposition begin as early as 24 hours after emergence, always at night and on the lower surface of the leaf, and continues for a period of several days. The eggs generally hatch in 8 or 9 days, but in one instance slightly less than 6 days was required.

The first 4 larval instars, of which there are thought to be 7, were observed to require 5, 6, 6 to 8, and 18 days, respectively. The winter is passed as a half-grown caterpillar, the majority hibernating after the third molt, though some have been found to hibernate in the fifth, some in the third, and a very few in the second, instars. This often takes place just beneath the leaf buds, but may occur in any well-protected rough or angular spot on the twigs and smaller branches.

Three hymenopterous parasites have been obtained from the bud moth in Quebec, namely, *Pimpla* (*Itoplectes*) *conquisitor*, (*Microdus*) *Bassus earinoides*, and *Pentarthron minutum*. Spraying experiments with lime-sulphur to which lead arsenate was added at the rate of 5 lbs. paste to 100 gal. was found to be most effective when employed as soon as the leaves expanded, and next in effectiveness when applied just before the petals spread.

The pecan leaf case-bearer, J. B. Gill (*U. S. Dept. Agr. Bul. 571* (*1917*), *pp. 28, pls. 3*).—This is a report of investigations at a field station at Monticello, Fla., of *Acrobasis nebulella*, one of the principal insect pests with which the pecan grower has to contend. A brief account of the pest has been given by the author in a publication on pecan insects previously noted (E. S. R., 38, p. 157), as has studies of the pest by Herrick at the Texas Experiment Station reported in 1909 (E. S. R., 22, p. 461).

The species was first described by Riley in 1872 from a single specimen reared from wild crab (*Cratægus* sp.). It is a native insect that is distributed more or less over the same territory as the hickories which form its preferred hosts, but the author has found it very difficult to collect the larvæ on species other than the pecan, even in sections where it ranks as a pest in pecan orchards. There is said to be an apparent varietal resistance of the pecan to its attack, some being badly infested while others are slightly so; in general, pecan trees with very small leaves seem less likely to be heavily infested by it.

The most serious damage to pecans occurs during the early spring, when the larvæ feed voraciously upon the unfolding buds and leaves. Just as the buds are bursting, the overwintering larvæ gnaw their way out of their hibernacula or winter cases packed around the buds, and migrate immediately to the tips of the swelling buds, upon which they commence to feed. Some larvæ have been observed to eat directly through the side of the buds instead of at the tip as is usually the case. The larvæ, when in sufficient numbers, are capable of eating the green foliage as rapidly as it appears, and it is not unusual for the trees to remain defoliated for a considerable length of time. On such trees the buds turn brown as a result of the feeding of the larvæ and a block of badly infested trees takes on the appearance of blight by fire. When the infestation is less severe the larvæ web and tie the tender leaves together into masses, which soon become unsightly due to the wilting of the leaves and the presence of particles of excrement and larval cases with which they are united.

Biological studies at Monticello during 1913, 1914, and 1915 in an open-air insectary are reported upon, much of the data being presented in tabular form. The adults, which may emerge from early May to early August, live from 2 to 10 days, with an average of 4.8 days, during which time as many as 182 eggs may be deposited. From 6 to 9 days are required for the incubation of the eggs, which may hatch from the middle of May to the first days in August. the young larvæ feed sparingly upon the foliage throughout the summer and early fall for a period of nearly 3 months or even longer in some instance, during which time they hardly attain a length greater than 0.06 in. During the latter part of September they begin to seek hibernating quarters around the buds, where they construct small, compactly woven, oval hibernacula and

by the middle of October practically all larvæ will have left the foliage and may be found snugly protected in the hibernacula. They remain in hibernation until the latter part of March or the first days of April, when they emerge and attack the unfolding leaves. The larvæ reach full maturity from about April 20 to the latter part of June, but the majority pupated between May 10 and June 10 in 1913 and about 10 days later in 1914 and 1915.

Among the parasites reared from the pupa of this case-bearer are *Itoplectis conquisitor*, *Triclistus apicalis*, *Calliephialtes grapholithæ*, and *Pristomerus* sp., of the Ichneumonidæ; *Macrocentrus delicatus*, *Meteorus* sp., *Habrobracon variabilis*, and *Orgilus* sp. of the Braconidæ; *Secodella acrobasis* and *Cerambycobius* sp. of the Chalcidoidea; and *Leskiomima tenera* and *Exorista* sp. near *pyste* of the Tachinidæ. *Spilochalcis vittata* has also been reported from this host and *Trichogramma minutum* was on one occasion reared from its eggs. The small chalcidoid *S. acrobasis*, which was reared in great abundance from the overwintering larvæ, is the most effective of the parasites.

Experimental control work which extended over a period of three years is reported in detail. The work shows conclusively that no matter how badly an orchard may be infested, the pest can be controlled by a single application of arsenical solution combined with lime, if made during the latter part of the summer. The best results are obtained from the use of 1 lb. of powdered or 2 lbs. of paste arsenate of lead and 3 lbs. of freshly slaked lime to each 50 gal. of water. It is pointed out that arsenate of lead should not be used under any circumstances without the addition of lime as loss from injury to the foliage and nuts is likely to follow. Spraying may be done with equal effectiveness any time between the first of August and the middle of September, which is after the eggs have hatched.

An annotated list of 19 references to the literature cited is appended.

An outline of the life history of the clothes moth, Tineola biselliella, R. C. Benedict (*Science, n. ser., 46 (1917), No. 1193, pp. 464–466*).—The author's investigations of clothes moths, conducted with a view to solving the problem of moth proofing ordinary woolen fabrics, have led to the conclusion that, in the vicinity of New York City at least, the case-making clothes moth (*Tinea pellionella*) is of comparatively rare occurrence and that the extensive damage which is done in connection with the fur and woolen trades is due almost entirely to the yellow clothes moth (*T. biselliella*). Both the black and buffalo carpet beetles were found invariably in each supply of moth material examined, but in comparatively small numbers. A much larger unidentified beetle occurred in great numbers in the supply of blown hat fur and rabbit skins which had their source in Australia.

Egg laying began within 24 hours after mating and from 30 to 160 eggs were deposited, the usual number being between 40 and 50. At the completion of oviposition, which might be in one day or as long as three weeks, the female dies. The eggs are carefully placed among the threads of the cloth and fastened by some glutinous material so that they do not readily shake off. Hatching begins in 7 days and the larvæ commence to feed immediately. They take the color of the cloth fed upon, the dyes passing through the alimentary canal apparently unchanged. When a larva wished to change its feeding place it either continued its gallery, sometimes for several inches, or left it entirely and built another. The larval stage is completed in a minimum period of 10 weeks while the cocoon stage lasts at the shortest two weeks.

Control experiments which were directed toward the discovery of a poison that would destroy the larvæ through their food and which would not be harmful to human beings have given negative results.

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The biological method of control for Oeceticus platensis, P. C. MASSINI (*An. Soc. Rural Argentina, 51* (*1917*), *No. 5, pp. 373–378, figs. 8*).—A report upon the efficiency of several hymenopterous parasites in the control of this lepidopteran.

The malaria parasite in the mosquito.—The effects of low temperature and other factors on its development, M. B. MITZMAIN (*Pub. Health Rpts.* [*U. S.*], *32* (*1917*), *No. 35, pp. 1400–1413*).—"In the work presented here it is indicated that development of the exogenous elements in the mosquito is restricted or prevented during an intermittent low temperature even when temperatures favorable to parasite development are present in the early stages and subsequently. The presence of even great numbers of oocysts in various stages does not give assurance of subsequent maturity and infectivity. Of the 18 infected anophelines kept at low temperature only one appeared to give rise to mature parasites, while the one control specimen of *Anopheles quadrimaculatus* retained at room temperature reached normal maturity relative to sporozoite development. *Plasmodium falciparum* was the species of parasite used. The oocyst stage was maintained up to 59 days in the mosquitoes employed in these experiments."

Reference is made to the work by King, previously noted (E. S. R., 36, p. 858).

The Mediterranean fruit fly in Hawaii, E. A. BACK and C. E. PEMBERTON (*U. S. Dept. Agr. Bul. 536* (*1918*), *pp. 118, pls. 21, figs. 24*).—This is a summary of the present status of the knowledge of *Ceratitis capitata*, based upon a review of the literature and extensive investigations conducted by the authors, much of which data is presented in tabular form. The subject is considered under the headings of origin, distribution, source of Hawaiian infestation, conditions favorable to establishment in the Hawaiian Islands, economic importance, injury, methods of spread, host fruits, life history and description, seasonal history, natural control, and artificial control. Some of the data included have been previously noted from other sources (E. S. R., 37, p. 565).

It is concluded that with the pest well established in Bermuda and the Hawaiian Islands it will only be a matter of time before it will be inadvertently introduced into and become established in California and the Southern States. It is pointed out that this fruit fly has been reared in Honolulu from 72 species of host fruits, including the peach, plum, pear, guava, mango, orange, lemon, grapefruit, banana, etc., and that no edible fruit in Hawaii, except the pineapple, escapes its attack although the banana is never infested unless overripe or injured. While a single generation may require as few as 17 days during the warmest weather, there are usually 15 to 16 generations a year at Honolulu and 10 to 12 generations in areas where the winter mean temperature drops to 68° F.

As regards control measures, it is concluded that at the present time the only hope of relief lies in the establishment of parasites, six of which have been introduced during the past three years and have already become well established. While they have more than repaid the Territory of Hawaii for the cost of their introduction by bringing about an improved condition in the coffee-growing industry, it is doubtful whether they will effect a sufficient decrease in the proportion of infested host fruits to be considered efficient factors in control, since adult flies maturing in thick-meated fruits, or in fruits protecting larvæ by other means from attack by parasites, will neutralize the effective work of parasites attacking larvæ in thin-skinned and thin-pulped fruits. Accumulated data indicate that the fruit fly will not become a serious pest in a climate where the mean temperature is below 50° F. during periods covering three months of the year. Freezing temperatures can be withstood

successfully only for short periods and little if any development takes place at 50°.

While Hawaiian conditions are unfavorable to the use of poison sprays, the authors' work has convinced them that such sprays could be employed successfully in combating this pest in commercial orchards of California and of the Southern States should they become infested. Attention is called to the use that can be made of commercial cold storage, the data presented indicating for the first time the duration of time required for various temperature ranges to kill the stages of the fruit fly within stored fruits. From these records it is reasonable to conclude that the certification of properly refrigerated fruit is practicable.

Considerable attention is given to parasites of the fruit fly, the history, description, and biology of *Tetrastichus giffardianus*, *Opius humilis*, *Diachasma tryoni*, and *D. fullawayi* being reported upon, and a discussion included of methods of rearing the parasites, struggle for supremacy among them, etc.

Fruit fly parasitism in Hawaii during 1916, C. E. PEMBERTON and H. F. WILLARD (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 2, pp. 103–108*).—The data here presented supplement the parasitism studies considered at length in the report above noted and an earlier paper covering the year 1915 (E. S. R., 35, p. 760). The paper includes tabular data on the extent of infestation of host fruits by larvæ of *Ceratitis capitata* in Hawaii during 1916, percentage of larval parasitism of *C. capitata* in Hawaii in 1916 and 1917, and total parasitism by months of all larvæ of *C. capitata* collected in Hawaii during 1916.

The total percentage varied from 6.98 per cent in January to 45.2 per cent in September. The percentage of parasitism by *Diachasma tryoni* fell in the winter and spring to as low as 0.2 (March) and rose in the summer and fall to as high as 34 (September). "The parasite *Opius humilis*, more hardy and prolific than any of the other introduced species, has been overshadowed by the other species, particularly by *D. tryoni*, and has had its seasonal rise and fall directly the reverse and entirely dependent upon the rise and fall of this species of Diachasma. The slight seasonal changes have little visible effect upon the activities of *O. humilis*, however, for in the winter and spring, with the decrease in abundance of *D. tryoni*, it rapidly ascends and becomes the most effective check upon the fruit fly."

A comparison of data secured during the years 1914, 1915, and 1916 indicates that the parasites now present in the Territory have reached their maximum degree of development and can hardly be expected to attain a greater control of the fruit fly than that evidenced in 1916.

A new genus of Anthomyiidæ, J. R. MALLOCH (*Bul. Brooklyn Ent. Soc., 12 (1917), No. 5, pp. 113–115*).—The genus Emmesomyia is erected for two new species.

A study of the factors which govern mating in the honeybee, G. D. SHAFER (*Michigan Sta. Tech. Bul. 34 (1917), pp. 5–19, pls. 3, figs. 2*).—This brief report of investigations conducted during 1916 deals with the structural characters of the reproductive organs of both the queen and drone; position assumed by the queen and drone in coition on the mating flight; attempts to control either mating or fertilization of the queen honeybee; classification of certain recorded attempts to control mating, giving instances of mating during confinement in one way or another and instances of artificial fertilization by hand; and attempts at controlling mating carried out under this investigation.

Report from the division of bees for the fiscal year ended March 31, 1916, F. W. L. SLADEN ET AL. (*Canada Expt. Farms Rpts. 1916, pp. 1151–1194, pls. 4*).—The work of the year at the branch stations and the Central Experimental

Farm is first reported upon by the apiarist (pp. 1151–1169), followed by reports by the superintendents on bee work at the experimental farms (pp. 1169–1194).

A table summarizing the production of bees at 14 Dominion experimental farms in 1915 is included.

Beekeeping for the fruit grower and small rancher or amateur, G. A. COLEMAN (*California Sta. Circ. 185* (*1917*), *pp. 11, figs. 8*).—A popular summary of information on beekeeping.

Results of cooperative experiments in apiculture, M. PETTIT (*Ann. Rpt. Ontario Agr. and Expt. Union, 38* (*1916*), *pp. 33–40, fig. 1*).—A brief report of the results of cooperative work in Ontario.

The North American wasps of the subgenus Pemphredon, S. A. ROHWER (*Bul. Brooklyn Ent. Soc., 12* (*1917*), *No. 5, pp. 97–102*).—A key is given to the nearctic species of Pemphredon, and descriptions of four new species and notes on several others.

The Cattleya fly, J. B. MOORE (*New Jersey Stas. Bul. 308* (*1916*), *pp. 3–12, pls. 2*).—The hymenopteran *Isosoma orchidearum*, known as the Cattleya fly, which was imported with orchids prior to 1888, is now the most serious enemy of certain species of Cattleya. At first considered to be of little importance, the infestations have increased to such an extent that many growers have been forced out of business. Its injury is caused by the larvæ which burrow out the interior of the young buds or young pseudo-bulbs and weaken the growth to such an extent that very poor blooms or no blooms at all are produced. *C. mossiæ* and *C. gaskeliana* have very few injuries, while *C. labiata*, *C. percivaliana*, *C. gigas*, and *C. trianæ* are badly affected.

In the author's life history studies of the pest, which extended over a period of 13 months, *C. labiata* and *C. trianæ*, inclosed in a wire cage were used as host plants. The first brood emerged the last week in February, two broods emerged in March, two in April, etc. The egg is deposited beneath the epidermis at the base of the young growths and the injury can be detected by a swelling. The period from oviposition to emergence covers at least three months in the winter. Upon hatching out the larvæ feed upon the soft interior of the pseudo-bulb, forming small cavities in which they later pupate, and as many as 10 may be found in the same cavity. A single female was observed to make 34 piercings within 18 hours, and it is thought possible that each female lays more than 50 eggs during the three or four days of her life.

In fumigation for the destruction of the adults, which must be done every night, Nicofume proved much more satisfactory than pyrethrum, though neither is sufficiently effective. Spraying for the pest does not appear to be practicable. In experimental injections of ether, chloroform, carbon bisulphid, nicotin solution, and pure air separately into infested growth, the first three killed both insect and infested part of the plant. While nicotin solution killed the insect in the cavity it did not permeate the plant tissues. The author found that the simple piercing of the shoot, i. e., the injection of pure air into the cavity, kills the insects, and he concludes that piercing the swollen portion is a satisfactory method of control just so long as the cavity is exposed to the air, but if the stab is made in the wrong place or if only one or two cavities are stabbed, reproduction of the flies is not prevented. The destruction of the infested parts appears to be the best method of control known, and in doing so all growths less than 18 months old should be examined at least once a week, unless the grower has not imported orchids or had no infestations for a year or longer.

A revision of hymenopterous insects of the tribe Cremastini of America north of Mexico, R. A. CUSHMAN (*Proc. U. S. Nat. Mus., 53* (*1917*), *pp. 503–551*).—This revision includes descriptions of one genus (Neocremastus) and 29 species new to science. Among the new species are *Cremastus flaviceps* reared

from *Pulvinaria bigeloviæ* at Grand Junction, Colo., and Port Lavaca, Tex.; *C. minor* reared from the blackhead fireworm at Whitesbog, N. J., from *Gnorimoschema artemisiella* at Chicago, Ill., from *Gelechia* sp.. at Benton Harbor, Mich., from the pecan cigar case-bearer at Victoria, Tex.. and from *Eucosma strenuana* on *Ambrosia trifida* at Washington, D. C.: *platynotæ* and *Platynota flavedana* at Tempe, Ariz.; *C. tortricidis* and *C. epagoges* reared from *Epagoges sulfureana* at Nashville, Tenn.; *C. evetriæ* from *Evetria bushnelli* at Fort Bayard, N. Mex.; *C. cleridivorus* reared from the larvæ of *Enoclerus quariguttatus* at Kanawha Station, W. Va., Tryon, N. C., and Lawrence, Kans.; *C. rosæ* from rose hips in company with *Rhynchytes bicolor* but which were also apparently infested with a lepidopterous larva, at Vienna, Va.; *C. tetralophæ* from *Tetralopha subcanalis* at Monticello, Fla.; and *C. mordellistenæ* from *Mordellistena morula* in Colorado.

The author has found that *C. decoratus* has apparently been introduced into the United States with one of its European hosts, *Evetria buoliana*, a specimen having been reared from that host on Long Island, N. Y. *C. forbesii*, originally described from specimens reared from *Acleris minuta*, is represented in the National Museum by specimens reared from *Gelechia trialbamaculella* at Pemberton, N. J., blackhead fireworm at Pemberton, N. J., *G. confusella* at Benton Harbor, Mich., and *Episimus argutanus* at East River, Conn.

Notes and descriptions of miscellaneous chalcid flies (Hymenoptera), A. A. Girault (*Proc. U. S. Nat. Mus., 53 (1917), pp. 445–450*).—Twelve species representing ten genera are described as new. Among these are *Tumidiscapus oophagus*, many specimens of both sexes of which were reared from eggs of *Oxya velox*, at Coimbatore, Southern India; *Abbella americana* reared from jassid eggs in Elymus, at Salt Lake City, Utah; and *Sympieses ancylæ* reared from *Ancylis* sp. at Whitesboro, N. J.

The fish louse (Argulus foliaceus), R. Merle (*Sci. Amer. Sup., 84 (1917), No. 2189, p. 373, fig. 1*).—A brief account of *A. foliaceus*, which destroys carp, etc., with a discussion of preventive and remedial measures.

Brazilian cecidia of plants belonging to the families Compositæ, Rubiaceæ, Tiliaceæ, Lythraceæ, and Artocarpaceæ, J. S. Tavares (*Broteria, Ser. Zool., 15 (1917), No. 3, pp. 113–181, pls. 6, figs. 4*).—This contribution to the knowledge of Brazilian cecidia includes descriptions of 4 genera and 11 species new to science.

FOODS—HUMAN NUTRITION.

Chemistry of food and nutrition, H. C. Sherman (*New York: The Macmillan Co., 1918, 2. ed., rev. and enl., pp. XIII+454, figs. 16*).—This book has been rewritten and enlarged to include the results of the more important investigations in nutrition since the first edition (E. S. R., 24, p. 759). Among these may be mentioned the greatly extended knowledge of the nature and nutritive value of individual proteins and of the chemical changes involved in the intermediary metabolism of carbohydrates, fats, and proteins; new data on energy requirements under different conditions; and additional facts concerning inorganic constituents, particularly calcium and phosphorus, and the maintenance of neutrality in the body. Perhaps the most interesting and significant of the recent investigations are those which have led to the establishment of new factors essential to the nutritive requirements of the body, the unidentified substances referred to as " vitamins " or as " fat soluble A" and " water soluble B." These are described in the chapters on antiscorbutic and antineuritic properties of food in relation to growth and development.

The book closes with a chapter on dietary standards and economic use of food in which the problems of an adequate diet are discussed from the viewpoint of

nutritive value and economy. While emphasizing the fact that under modern conditions scientific dietary standards based on a knowledge of food chemistry and nutritive requirements "constitute the most rational guide to the formation of hygienic and economic habits in the use of food," the author states that too much weight must not be attached to any attempt to state the requisites of an adequate diet in terms of quantities of certain nutrients.

Many additions and some changes have been made in the tables in the appendix. The table of ash constituents contains many hitherto unpublished analyses, and the data are uniformly given as percentages of the elements and not of their oxids. An extensive list of references to the original literature is given at the end of each chapter.

Special attention has been given throughout the book to the task of presenting the striking results of the most recent investigations in nutrition in such a manner as "to make clear their importance without giving exaggerated impressions and with due emphasis upon the fact that on many significant points any interpretation which can now be offered is necessarily tentative."

Food in war time, G. Lusk (*Philadelphia and London: W. B. Saunders Co., 1918, pp. 46*).—This book contains three short articles—A Balanced Diet; Calories in Common Life; and Rules of Saving and Safety.

[The work of the Office of Home Economics, U. S. Department of Agriculture], Mrs. J. C. Gawler (*Gen. Fed. (Women's Clubs) Mag., 16 (1917), No. 9, p. 26*).—A summary of data regarding the organization and work of the U. S. Department of Agriculture with special reference to war-time activities.

What the Department of Agriculture is doing to aid women's war work (*Gen. Fed. (Women's Clubs) Mag., 16 (1917), No. 9, pp. 17, 18*).—Information is given regarding the general work of the U. S. Department of Agriculture in home economics, its extension work, and its relations to the Food Administration.

Conservation of food by substitution with suggestive menus for families of two and five, prepared as far as possible with reference to emergency food conditions (*Mich. Agr. Col., Dom. Sci. and Home Econ. Ext. Depts. [Pub., 1918], pp. 96*).—This bulletin discusses the five food groups and the planning of meals to include proper proportions of food from each group. Suggestive menus for fall, winter, spring, and summer for families of two and five, prepared as far as possible with reference to emergency food conditions, are given.

[Food conservation], Dora E. Wheeler (*Women's Munic. League Boston Bul., 9 (1917), No. 1, pp. 11–20, figs. 2*).—Data on the saving of wheat and substitutes for sugar and recipes for Italian dishes are included.

Notes from the Department of Food Sanitation and Distribution (*Women's Munic. League Boston Bul., 9 (1918), No. 2, pp. 27–29*).—Recipes for the use of corn and corn products and inexpensive Italian dishes are given.

Economy in feeding the family.—I, Some essential facts regarding nutrition, J. P. Street and E. H. Jenkins (*Connecticut State Sta. Bul. 196 (1917), pp. 15*).—This bulletin is the first of a series designed to help "those who provide the food of families to have a clearer understanding of the principles of nutrition, of the amount of food necessary for health and efficiency, and of the most economical methods of buying and preparing food." It contains a short discussion of the following topics: The uses of food, the chemical composition of food, the special uses of the proteins, carbohydrates and fats of the food, the expression of the quantities of food ingredients and their energy, the number of calories needed by the body each day, and the application of the knowledge of calories to the preparation of the daily meal. A table is included

showing the number of calories yielded by standard portions of various common foods.

Economy in feeding the family.—II, The cereal breakfast foods, J. P. STREET (*Connecticut State Sta. Bul. 197* (*1917*), *pp. 19–43*).—In this popular discussion data are reported in tabular form showing the cost, net weight per package, total calories, percentages of water, fat, crude fiber, protein, ash, carbohydrates other than fiber, and starch, and of the food value and cost of serving of a large number of breakfast foods and other cereal preparations.

Other grains than wheat in bread making, W. L. STOCKHAM (*North Dakota Sta. Bul. 123* (*1917*), *pp. 100–105, figs. 3*).—The need for including a greater proportion of the wheat berry in flour and the use of other grains in bread making are discussed. In tests reported admixtures of different extractions of rye and wheat flour in varying proportions were used in bread making, as were a series of blends of barley flour and wheat flour. Photographic illustrations of the resulting loaves are given.

Milling value of barley, T. SANDERSON (*North Dakota Sta. Bul. 123* (*1917*), *pp. 106, 107*).—Experimental data on barley milling are reported and the economic use of barley discussed.

"According to the . . . figures [given], it would be possible to use an amount of barley flour that would produce a loaf of bread very little below the quality of bread made from all wheat flour and at less cost than if made from all-wheat flour."

[Milling and flour investigations] (*Kansas Sta. Rpt. 1916, p. 22*).—From the investigations noted, it is concluded that the "baking qualities of flour are markedly influenced by protein decomposition products, and that a large amount of nitrogen in amino form is an indication of poor baking qualities."

In bacteriological analyses of 51 samples of flour, "ropy" bread organisms were found in 40 per cent. Since these organisms were found in the better grades of flour in much higher proportion than the corresponding losses from "rope" indicate, the ultimate source of the trouble is ascribed to bakery practice rather than the flour used.

A large number of baking tests to determine the effect of egg albumin as an ingredient of baking powder showed no measurable effect in the amounts used.

Six years' milling tests by grades, E. F. LADD, ALMA K. JOHNSON, and T. SANDERSON (*North Dakota Sta. Spec. Bul., 4* (*1917*), *No. 17, pp. 411–435*).—This bulletin contains a summary of the results of milling tests carried on from 1911 to 1916, inclusive, and previously noted (E. S. R., 34, p. 759; 36, p. 464, 471; 37, p. 863).

The contributions of zoology to human welfare, H. M. SMITH (*Science, n. ser., 47* (*1918*), *No. 1213, pp. 299–301*).—The author calls attention to the service rendered by zoologists in learning the best methods of fish production and protection in the United States.

Sanitation of steamers (*Cal. Bd. Health Mo. Bul., 13* (*1918*), *No. 8, pp. 358–361, figs. 2*).—In this account of inspection work by E. T. Ross some information is given regarding methods followed in preparing food and regarding sanitary conditions, which in passenger steamers inspected were generally found to be quite good. The sanitary condition of employees' living quarters and similar topics are discussed.

Lye unnecessary with hot water [for sterilizing glasses] (*Cal. Bd. Health Mo. Bul. 13* (*1918*), *No. 9, p. 402*).—This editorial states that the recent California law requiring sterilization of drinking glasses has met with some confusion in interpretation.

"The facts are that the soda solution is an approved substitute for sterilization by steam and boiling water, but it is not required that the solution be used hot. . . . It is intended that the lye solution shall be used when arrangements for heating are not available."

A comparison of three methods of determining defective nutrition, F. A. Manny (*Arch. Ped.*, *35* (*1918*), *No. 2*, *pp. 3–9*).—Data compiled from a study of defective nutrition among 2,538 pupils in two New York City schools are given here. The basis upon which the need of care is determined varies among physicians. Three methods for determining the condition of defective nutrition are here compared. The weight and height measurements of each child were taken and an experienced physician examined the pupils, classifying them into four nutrition grades (1) superior condition, (2) passable, (3) border line, and (4) very bad according to the Dunfermline scale. Some results of the comparison are summarized below:

"Among these 2,538 children the number assigned to care was greatest according to the scale, second on the basis of weight-age, and least on that of weight-height. With reference to sex and age the scale and the height-age basis showed deterioration with increased age for the boys and the reverse condition for the girls. The other two bases show deterioration in both sexes, but this condition was much more marked among boys on the weight-age basis and for girls on the weight-height basis.

"The scale groups requiring care would have been detected nearly twice as well by the weight-age basis as by the weight-height. The weight-age groups requiring care would have been detected nearly three times as well by the scale as by the weight-height basis. The weight-height groups requiring care would have been detected nearly half as well again by the scale as by the weight-age basis.

"The underheight group shows closest relation to the weight-age underweight group—91.9 per cent. Next in order comes those defective according to the scale—78.4 per cent—while only 13.5 per cent of those underheight are also underweight for their height.

"Even weight and even height decrease with age—more rapidly with the boys than with the girls. Overweight and overheight increase more rapidly with the girls than with the boys, and the girls of 14 show actually less underheight than do those of 7. The girls increase slightly in underweight and the boys increase in percentage of both underweight and height."

It would seem from these data that any adequate system of diagnosis will make use of the advantages of both weight relationships and points to the need of careful study in order to work out a system of diagnosis. The Dunfermline scale is an attempt in this direction.

On the assumed destruction of trypsin by pepsin and acid.—III, Observations on men, J. H. Long and Mary Hull (*Jour. Amer. Chem. Soc.*, *39* (*1917*), *No. 7*, *pp. 1493–1500*).—"The observations of this paper on the human subject justify the conclusions reached in previous work performed in vitro and with dogs[1] that under certain not unusual conditions trypsin may resist the action of pepsin and acid in the animal stomach through a considerable period following the ingestion of the ferment.

"It is evident that the action of this ingested trypsin is fully as pronounced, in the quantities used, as is that which seems to be carried back to the stomach, along with bile, by the regurgitation of duodenal fluid, but it can not be said that either effect is very important physiologically. The ingestion of a few

[1] Jour. Amer. Chem. Soc., 38 (1916), No. 8, pp. 1620–1638; 39 (1917), No. 1, pp. 162–174.

milligrams of commercial pancreatin or trypsin could not have great importance as a therapeutic measure.

"Some tryptic digestion may undoubtedly take place in a slightly acid medium, and therefore, at times, in the stomach."

ANIMAL PRODUCTION.

The relative value of field roots, F. T. Shutt (*Canada Expt. Farms Rpts. 1916, pp. 115–121*).—Analytical data are reported for a number of years on the composition of varieties of mangels, turnips, and carrots. For 1915, mangels varied in dry matter from 7.32 per cent to 13 per cent, and in sugar from 2.86 to 6 per cent. A test was made of the influence of heredity in mangels with two widely different varieties, Gate Post and Giant Yellow Globe, which were planted side by side for a period of 16 years. Gate Post invariably proved superior, averaging for the whole period 23 per cent more dry matter and 33 per cent more sugar than Giant Yellow Globe.

Thirty-three varieties of turnips were analyzed to determine the average composition for a 10-year period. For the year 1915 there was a difference of 5.58 per cent of dry matter, indicating that 2,000 lbs. of the best variety was equivalent to 3,860 lbs. of the poorest. The sugar content was fairly constant, averaging approximately one-fifth that of mangels.

Analyses made in 1915 with 10 varieties of carrots showed a difference in dry matter of 2.84 per cent between the best and poorest varieties, indicating that 2,000 lbs. of the former was equal to 2,665 lbs. of the latter.

The average composition of mangels, grown for 11 years, was, dry matter 11.02 and sugar 5.89 per cent; for turnips, grown for 10 years, dry matter 10.2 and sugar 1.27 per cent; and for carrots, grown for 10 years, dry matter 10.37 and sugar 2.69 per cent.

Utilizing the sorghums, T. F. Hunt (*California Sta. Circ. 187 (1917), pp. 7*).—Attention is called to the decreasing number of live stock due to present world conditions. To again increase this production is a slow process, and the first requisite is more feed. This circular emphasizes the value of the sorghums under California conditions and methods of conserving and feeding them.

Silage investigations (*Kansas Sta. Rpt. 1916, p. 21*).—It is deemed possible, but difficult, to make silage from alfalfa alone. It requires rigid exclusion of the air, and the addition of an easily fermentable carbohydrate, as molasses, corn chop, cane butts, or rye, is helpful, although these methods are not very practical. Meal from germinated corn is more effective than that from corn not germinated.

Inspection of commercial feedstuffs, P. H. Smith (*Massachusetts Sta. Control Ser. Bul. 7 (1917), pp. 30*).—The results of the feeding stuffs inspection from September 1, 1916, to April 1, 1917, are given, including analyses of 1,082 samples. Prices for the period have ruled high and supplies scarce, but with few exceptions goods offered have been as represented. Carbohydrate feeds have ruled relatively higher in price than proteins.

The feeds analyzed were cottonseed, linseed, corn germ, peanut, sesame, and gluten meals; distillers', brewers', yeast, and vinegar grains; malt sprouts; wheat middlings, red dog flour, and low-grade flour; durum wheat products; rye middlings; corn meal, corn bran, and corn and cob meal; ground oats and oat groats; hominy feed; provender; dried beet pulp; cut clover; alfalfa meal; and molasses, mixed, and proprietary feeds.

The analyses of cottonseed meals showed a lowered protein content, indicating the addition of ground hulls. The peanut oil cake, evidently without the hull, was of excellent quality.

An appended article on The Grain Problem, by J. B. Lindsey, discusses the relative values of feeds and their selection under present conditions.

[Miscellaneous analyses], F. T. Shutt (*Canada Expt. Farms Rpts. 1916, pp. 121–125, 178, 179*).—Analyses of bran, barley flour, oat flour, rice meal, flax chaff, flax shives, elevator dust, mangels, several proprietary and by-product feedstuffs, butter, poultry grit, and an egg preservative are reported. A test of the egg preservative indicated no advantage over saturated limewater.

Grazing experiment (*Kansas Sta. Rpt. 1916, pp. 20, 21*).—Plats protected until the predominant species matured seed showed good results. Seeding with a mixture of tame grasses did not establish a stand. With sweet clover, mowing on level land was practical and kept down weeds.

Cattle feeding, A. D. Faville (*Wyoming Sta. Bul. 117 (1917), pp. 55–64*).—Experiments were made during three years comparing oat and pea silage with alfalfa hay. The grain rations varied but were the same with lots directly compared.

The experiments during 1915–16 with beef cows were interrupted, but while no elaborate results were obtained the data indicated that 7 lbs. of a 15-lb. alfalfa ration could be replaced by 15 lbs. of oat and pea silage.

During the winter of 1916–17 the cows were fed for 16 weeks as one lot with and without oat and pea silage reversed every 4 weeks. With silage in the ration they made an average daily gain per head of 0.55 lb. with a ration costing 13.8 cts. daily. Without silage in the ration they made an average daily gain of 0.13 lb. on a daily cost of 13.7 cts. These results taken with others previously obtained (E. S. R., 34, p. 467) indicate that oat and pea silage can be substituted for alfalfa hay at 2 lbs. of silage to 1 lb. of hay.

With growing cattle in 1914–15 during 161 days those with oat and pea silage in the ration made an average daily gain per head of 0.84 lb. on a daily cost of 11 cts. Those without silage in the ration made a daily gain of 0.8 lb. at a cost of 13.4 cts. Approximately 9.5 lbs. of silage replaced 7 lbs. of alfalfa.

During 113 days of the winter of 1915–16 growing heifers with oat and pea silage in the ration made an average daily gain per head of 1 lb. costing 8.4 cts. daily. Without silage they made an average daily gain of 0.6 lb. on a ration costing 9.4 cts. per day. Ten lbs. of the silage more than replaced 5 lbs. of alfalfa. With grain and alfalfa the cost of 100 lbs. of gain was $15.92, while with the substitution of a part of the alfalfa with the silage it was $8.37.

In 16 weeks' feeding with growing cattle during the winter of 1916–17 the lots were reversed every 4 weeks. With silage in the ration they made an average daily gain per head of 1.4 lbs. on a ration costing 10.8 cts. per day. Without silage in the ration they made an average daily gain of 0.63 lb. on a ration costing 11.4 cts. daily. With grain and alfalfa it cost $18.26 per 100 lbs. of gain, while with silage in the ration it cost $7.70.

[Cattle feeding investigations] (*Kansas Sta. Rpt. 1916, pp. 34–36*).—One hundred head of 3-year-old heifers were divided into five lots and fed for 20 days during the winter. The rations were feterita silage and alfalfa, Kafir corn silage and alfalfa, Kafir corn stover and alfalfa, Kafir corn stover and alfalfa on range lot, and Sudan stover and Kafir corn silage. Kafir corn silage and alfalfa made the greatest gain, the animals averaging 0.87 lb. daily at a cost of 6.1 cts. per pound. The Kafir corn silage was better preserved and more palatable than the feterita silage.

In another test of 120 days' duration 40 heifers were fed silage, alfalfa, and straw and another 40 the same feed with the addition of 4.54 lbs. of corn-and-cob meal and 1 lb. of linseed meal a day. The first lot made an average daily gain per head of 0.92 lb. at a total feed cost of $4.73 per head. The second lot,

grain fed, made an average daily gain of 1.88 lbs. at a totl feed cost of $11.43 per head.

Beef cattle, E. S. ARCHIBALD ET AL. (*Canada Expt. Farms Rpts. 1916, pp. 387–422, pls. 5*).—An experiment was carried out at the station at Charlottetown, P. E. I., from November 1, 1915, to March 8, 1916, to determine the gains and profits in fattening beef and dairy types of steers. The grain mixture fed was made up of bran, barley, and oats, with a roughage of timothy, oat, and clover hay, turnips, and mangels. Some of the results obtained are shown in the following table:

Tests in fattening beef and dairy types of cattle.

Lot.	Type.	Number of animals.	Average daily gain per steer.	Average cost per pound of gain.	Dressed weight per steer.	Profit per steer.
			Lbs.	*Cts.*	*Per cent.*	
I	Beef (two good, one fair, one rangy)	4	2.33	7.60	54.3	$16.09
II	Dairy (Holstein grades)	4	2.08	8.50	51.9	12.87
III	Beef (Shorthorn)	4	1.90	9.05	57.3	12.21
IV	Dairy (mixed grades)	4	2.15	8.06	54.5	17.06
V	Dairy (Holstein grades)	3	2.30	7.98	57.0	17.72

The third-year results are reported of an experiment carried out at the Nappan Station, N. S. The objects of this trial were to determine the results of increasing the root and grain ration 50 per cent for light and heavy-weight steers, to find the profit in feeding these two types, and to show the value of molasses in finishing beef.

Sixteen well-bred Shorthorn steers were divided into four lots of 4 steers each, good butchers in lots 1 and 3 and good stockers in lots 2 and 4, the latter being somewhat thinner. The steers were fed a mixture of 40 per cent barley and oats, 40 per cent bran, 10 per cent oil cake, and 10 per cent cottonseed meal, with a roughage of turnips and clover hay, and lots 2 and 3 receiving 50 per cent more roots and meal than lots 1 and 4. Half of each lot received, in addition to the regular ration, 2 lbs. of molasses per head per day.

Some of the results are shown in the following table:

Results of steer-feeding experiment, January 1 to April 3, 1916.

Lot.	Type.	Average daily gain per steer.	Daily cost of feed per steer.	Average cost per pound of gain.	Profit per steer.
		Lbs.	*Cts.*	*Cts.*	
I	Butchers (light fed)	1.927	20.24	10.50	$16.13
III	Butchers (heavy fed)	2.358	26.66	11.31	13.68
IV	Stockers (light fed)	1.811	20.24	11.17	14.28
II	Stockers (heavy fed)	1.941	26.66	13.73	10.98

The average daily gain of the steers with molasses in the ration was 2.17 lbs. at a cost of 11.49 cts. per pound, and without molasses 1.77 lbs. at 12.42 cts. The average profit per steer was $13.57 with molasses and $13.90 without. The average for three years with good butchers shows a daily gain of 2.252 lbs. at a cost of 10.33 cts. per pound for heavy-fed steers, as compared with a daily gain of 2.094 lbs. at a cost of 8.646 cts. per pound for the light fed; with good stockers a daily gain of 2.114 lbs. at a cost of 11.08 cts. for the heavy fed, as

compared with 1.9 lbs. at a cost of 9.57 cts. with the light fed. While heavy feeding increased the weight, it also increased the cost. Molasses also produced an increase in weight, but at a cost above $20 or $23 per ton it produced no profit during the three years of the experiment.

From the three years' results, it appears that the greatest profit can be secured with 40 to 50 lbs. of roots and an average of 6.5 lbs. of grain per day, beginning with 2 or 3 lbs. and finishing with about 10 to 12 lbs. while decreasing the roots.

In an experiment conducted at the station at Kentville, N. S., to compare turnips with silage 24 steers were divided into two lots of 12 each. Each of the steers in lot 1 was fed 60 lbs. of pulped turnips for the first six weeks, 50 for the next two, 40 for the next two, and 35 for the remaining six; those in lot 2, 40 lbs. silage per day for the first six weeks, 35 for the next two, 30 for the next two, and 25 for the remaining six. The grain ration, made up of wheat bran, cottonseed meal, ground oats, and corn meal, 2:2:1:1, was fed each steer as follows: One lb. each per day for the first week, 2 lbs. for the second, 4 lbs. for the next two, 6 lbs. for the following two, 7 lbs. for the next two, 8 lbs. for the next four, and 9 lbs. for the remaining four, an average of 6.17 lbs. meal per steer per day. Ten lbs. of mixed hay of fair quality was fed each steer daily.

During the 120 days of the experiment the turnip-fed lot made an average daily gain per head of 1.84 lbs. at a cost of 11.31 cts. per pound of gain, while the silage-fed lot gained 1.87 lbs. at a cost of 11.22 cts. The profit per steer for the former was $8.40, and for the latter $8.48. With turnips at $2 per ton and silage $3 per ton there is little difference indicated in the cost of the two rations.

Thirteen grade Shorthorn steers costing $6.23 per 100 lbs. and 11 dairy type steers costing $4.57 per 100 lbs. were fed at Fredericton, N. B., on rough crops of the farm to test the effect of the feeding on these types. The animals were fed for 140 days, beginning December 1, on a ration of 50 lbs. of turnips, 3 lbs. of grain mash, and hay. The Shorthorn grades made an average daily gain of 1.26 lbs. at a cost of 13.3 cts. per pound, while the dairy type made a daily gain of 1.11 lbs. at a cost of 15.1 cts. per pound. The Shorthorns sold for $8 per 100 lbs., yielding a net profit of $5.39 per animal, and the dairy type for $6.34, yielding a profit of $1.34 each.

An experiment was carried out at Brandon, Man., during the winter of 1914–15 to compare the effects of feeding cattle in a warm stable with feeding in an open shed and corral. A comparison was also made of mixed grass and green oat hay with straw and corn silage and with alfalfa hay. The cattle at the beginning of the experiment (November 13) cost $6.46 per 100 lbs. They were divided into four lots and were fed the same grain ration, consisting of chopped oats and chopped barley or corn, 2:1. The grain ration, started at 2 lbs. daily, was gradually increased to 8 lbs., at which rate it remained for about two months. The experiment was closed May 24, 1915, when the cattle were sold at $8.75 per 100 lbs.

The stable-fed steers showed a higher gain than the open-shed animals, a result contrary to former experiments. While the animals on hay made a greater gain than those on straw and silage, the latter brought a greater profit. The alfalfa hay, though higher in price, gave larger returns than the other hays.

At Indian Head, Sask., during the fall of 1915 60 steers were divided into five lots of 12 each for a trial of the different methods of wintering cattle. The lots were fed for 135 days, being given equal amounts of grain and all the prairie hay they would clean up. The two stable lots were fed in addition silage and roots.

Lot 1, bush shelter, made an average daily gain of 1.63 lbs. at a cost of 13.81 cts. per pound; lot 2, open corral, 1.6 lbs. at 13.92 cts.; lot 3, corral and open shed, 1.72 lbs. at 13.07 cts.; lot 4, stable, with addition of silage to ration, 1.56 lbs. at 11.75 cts.; and lot 5, stable, with addition of roots to ration, 1.72 lbs. at 10.77 cts.

In the Lethbridge (Alta.) section, where alfalfa is the principal field crop and stock raising has not progressed to the point where all the feed is utilized locally, the problem of disposing of the alfalfa hay is an important one. An experiment was carried out to determine the advisability of feeding alfalfa together with some other roughage.

Three lots of 21 steers each were fed as follows: Lot 1, alfalfa hay; lot 2, alfalfa hay and green oat sheaves, 3:1; and lot 3, alfalfa hay and dry corn fodder, 3:1. Of this roughage the steers were fed all they would clean up well, and in addition they were given small quantities of equal parts of crushed oats and barley. With alfalfa hay, valued at $10, green oat sheaves $10, dry-corn fodder $5, and crushed barley and oats $20 per ton, lot 1 made an average daily gain per head of 1.4 lbs. at a cost per pound of 13 cts.; lot 2, 1.6 lbs. at 12 cts; and lot 3, 1.2 lbs. at 14 cts. The average net profit per steer was $2.31, $4.65, and $1.27, respectively, for the three lots. It is thought that it pays to feed some other roughage with alfalfa as it gives variety to the ration and the animals eat more and make greater gains.

On December 1, 1915, an experiment was begun at Lacombe, Alta., with 197 yearling and two-year-old steers and heifers in testing the value of various hays and fodders as roughage. The animals were fed the same grain ration consisting of equal amounts of oats and barley well ground. The results were as follows:

Beef-feeding experiments with various roughages.

Lot.	Roughage.	Number of steers.	Average daily gain per steer.	Cost per pound of gain.	Profit per steer.
			Lbs.	*Cts.*	
I	Prairie hay	20	1.756	8.57	$13.06
II	Prairie hay and oat straw	118	.762	17.52	9.01
III	Prairie hay and green sheaves	19	1.508	11.09	10.56
IV	Green sheaves	20	1.220	13.36	8.96
V	Timothy and alsike hay	20	.921	20.70	5.84

The animals in lot 1 made fair gains, were consistent steady feeders, and were well finished at the close. Those in lot 2, fed hay and straw in separate racks, ate the hay but neglected the straw. The animals in lot 4 were off feed at times due to scouring. Those in lot 5 were well finished.

Silage for beef cattle investigations (*Kansas Sta. Rpt. 1916, p. 20*).—In the fourth trial with yearling beeves, those receiving a ration of ground corn, cottonseed meal, and alfalfa and silage as roughage showed more finish and bloom and dressed out a higher percentage but with a greater cost per unit of gain than those on other rations. Corn-and-cob meal made slower but cheaper gains than ground corn, while Kafir corn meal put on slower gains at a still lower cost. Where corn can not be secured at a reasonable price, Kafir corn seems to make a good substitute. Cattle fed no silage made the greatest gains and showed almost as much bloom as the silage lots.

Russian thistle silage for the maintenance of range cattle (*New Mexico Sta. Rpt. 1917, pp. 74, 75*).—A small cement silo was filled with silage made from Russian thistles of various stages of maturity varying in height from 1.5

to 3.5 ft. The filling was made in September and the silo opened in January. The first 5 ft. was spoiled and the remaining silage was of a dark brown color and strong acid odor. On being exposed to the air for a few hours it turned darker and developed a very unpleasant odor. When substituted for corn silage young stock and dry cows ate it fairly well. On a ration of 10 lbs. of alfalfa hay and 10 lbs. of the silage daily young heifers lost 10 lbs. each in 10 days and appeared to be hungry most of the time. This silage can not be said to be a good feed.

Sheep feeding.—VII, Fattening western lambs, 1916–17, J. H. Skinner and F. G. King (*Indiana Sta. Bul. 202 (1917), pp. 3–20; popular ed., pp. 7*).—A continuation of work previously reported (E. S. R., 36, p. 568), and made to obtain further data on fattening lambs. The experiments include a comparison of various roughages alone and in combination, as alfalfa hay, clover hay, and corn silage; the value of cottonseed meal and ground soy beans as supplements; and the influence of shearing and of sheltering on fattening lambs. Western lambs from Colorado were used, divided into nine lots of 25 each, and the tests continued from November 2 to March 2.

I. *Corn silage alone v. corn silage and dry roughage for fattening lambs.*—In this comparison the lambs in one lot on corn silage were given a feed of clover hay every fifth day to maintain their appetites. This was found necessary in former experiments where the lambs developed fickle appetites when fed on corn silage alone. The different lots were fed a basal ration of shelled corn and cottonseed meal (7:1). The lot with corn silage in addition as roughage (lot 1) gained an average of 17.5 lbs. per head at a cost of 15.43 cents per pound. The lot on corn silage as roughage with a feed of clover hay every fifth day (lot 6) gained 28.6 lbs. per head at a cost of 10.97 cts. per pound. The lot with clover hay and silage roughage, each as wanted (lot 7), gained 36.5 lbs. per head at a cost of 9.92 cts. per pound.

The silage-fed lot ate less grain than the other two lots. When finished they were valued at 13.5 cts. per pound and returned a profit of 83 cts. per head. The lot on silage with clover every fifth day was valued at 13.9 cts. per pound and returned a profit of $2.23 per head. The lot with silage and clover hay at will was valued at 14.25 cts. per pound and returned a profit of $3.18 per head.

II. *Clover hay v. alfalfa hay as roughage for fattening lambs.*—This experiment, comparing clover hay with alfalfa hay, is the fourth carried out for this purpose. In two of these trials clover has produced the best results and in two others the alfalfa. Where there was a difference in the quality of the hays, the better one, regardless of kind, produced the best results. While the animals consumed larger quantities of the poorer hay, the rate of gain was in every case in favor of the higher quality.

The lambs in this experiment on shelled corn and clover hay of medium quality (lot 3) gained an average of 34.4 lbs. per head at a cost of 9.71 cts. per pound. Those on shelled corn and alfalfa hay of excellent quality (lot 4) gained 36.6 lbs. per head at a cost of 9.12 cts. per pound. The clover-fed lambs were valued at 13.75 cts. per pound and returned a profit of $2.69 per head, while the alfalfa-fed were valued at 14 cts. per pound and returned a profit of $3.22 per head.

III. *Alfalfa hay v. alfalfa hay and corn silage for fattening lambs.*—Lambs fed shelled corn, alfalfa hay, and corn silage (lot 5), gained an average of 34.6 lbs. at a cost of 9.85 cts. per pound. The lambs were valued at 14.1 cts. per pound and returned a profit of $2.99 per head. This lot is compared with that in the previous experiment (lot 4) receiving shelled corn and alfalfa hay.

IV. *Ground soy beans v. cottonseed meal as supplement to ration for fattening lambs.*—In this experiment the ground soy beans and cottonseed meal were

fed as supplements to shelled corn, clover hay, and corn silage. The lambs fed ground soy beans (lot 8) gained an average of 35.1 lbs. each at a cost of 9.76 cts. per pound, were valued at 14.15 cts. per pound, and returned a profit of $3.09 per head. Comparison was made with lot 7, reported under series I.

V. *Influence of shearing on fattening lambs.*—In this experiment, lot 2, which was shorn in the beginning of the test and yielded 57 lbs. of wool, was compared with lot 7, as previously noted. The shorn lambs consumed slightly more feed and gained an average of 33.8 lbs. per head at a cost of 10.72 cts. per pound, were valued at 11.75 cts. per pound, and made a profit of 96 cts. per head.

VI. *Open shed v. barn as shelter for fattening lambs.*—In this experiment the lambs were all shorn. Those in the barn (lot 9) ate the same quantity of grain and silage but less hay than those in the open shed (lot 2). The barn-fed lambs gained an average of 33.1 lbs. each at a cost of 10.68 cts. per pound, were valued at 11.25 cts. per pound, and returned a profit of 51 cts. per head. This experiment, together with five similar experiments, showed higher profits from feeding lambs in open sheds than in the barn.

Sheep, E. S. Archibald et al. (*Canada Expt. Farms Rpts. 1916, pp. 532–559, pls. 4*).—Two experiments were carried out with lambs at the Central Experimental Farm, Ottawa, to compare the protein in various meals, to discover the comparative value of two new protein meals recently introduced into Canada, and to find the best nutritive ratio for fattening lambs. The 50 lambs in each experiment were devided into five lots of 10 lambs each, and besides protein feeds were given equal amounts of hay and silage. The grain was fed at the rate of 8 oz. per head in the beginning, increasing 2 oz. weekly until it reached 20 oz. in the seventh week, at which rate it remained until the end of the experiment. In the first experiment "short-keep" lambs were fed for the Christmas market from November 17 to December 15, a period of 28 days; in the second, "long-keep" lambs were fed from November 17 to February 9, a period of 84 days.

Average results from both experiments are shown in the following table:

Average results of lamb-feeding experiments.

Lot.	Kind of grain ration.	Nutritive ratio of grain mixture.	"Short-keep" lambs.			"Long-keep" lambs.		
			Average gain per animal.	Cost to produce 1 lb. of gain.	Net profit per animal.	Average gain per animal.	Cost to produce 1 lb. of gain.	Net profit per animal.
			Lbs.	*Cts.*		*Lbs.*	*Cts.*	
1	Corn meal	1:6.7	10.8	4.3	$1.85	18.7	10.1	$1.99
2	Gluten meal	1:4.8	11.2	4.1	1.82	18.2	10.3	1.86
3	Cottonseed meal	1:4.3	10.1	4.6	1.77	15.7	11.9	1.66
4	Linseed meal	1:4.1	9.5	5.0	1.66	13.1	14.7	1.33
5	Peanut meal	1:3.9	12.8	3.7	2.03	17.5	11.0	1.83

During the winter of 1915–16, two lamb-feeding experiments lasting 110 days each were carried out at Charlottetown, P. E. I., beginning December 1, to compare clover hay with mixed-grain hay (oats and barley cut in the milk stage), and to compare a heavy grain ration with a light grain ration. Each experiment included two lots of 10 lambs each. In the first experiment, in addition to the roughage under test, both lots were fed turnips and a heavy grain ration of barley, oats, and bran. Lot 1 received the clover hay as roughage; lot 2 received the mixed-grain hay up to February 20, when the supply became exhausted and clover hay was substituted. Up to February 20, lot 1

made the better and more economical gains, from which it is concluded that clover hay is the better roughage for fattening lambs.

In the second experiment each lamb of lot 1 started with 10 oz. of grain per day and each lamb of lot 2 with 6.4 oz., both lots finishing with 18 oz. per lamb. During the period of the experiment the lot on the heavy grain ration made an average gain per animal of 0.162 lb. daily, at a cost of 15 cts. per pound; that on the light grain ration averaged 0.126 lb. daily, at 17.9 cts. per pound.

A trial was made at Agassiz, B. C., of fattening ram and wether lambs on rape. The lambs were pure-bred Dorset Horned, the rams being the better individuals. The rape was only a fair crop and would support only 11 lambs to the acre for 54 days. The lambs were run 14 days without grain and were then fed 1 lb. each per day of a mixture of 4 parts whole oats, 2 parts crushed barley, 1 part linseed oil meal, and 1 part corn meal. During the 54 days of the test the rams made an average daily gain of 0.54 lb., at a cost of 4.6 cts. per pound, the wethers a gain of 0.453 lb., at 5.6 cts. The value of an acre of rape with the ram lambs was $17.97, with the wethers $14.03.

Lamb feeding (*New Mexico Sta. Rpt. 1917, pp. 85–87*).—This experiment was made to determine whether lambs would make profitable use of weeds and other roughage that usually go to waste, and also to determine the most economical ration for finishing them for market.

Rambouillet grade lambs, 168 in number, were run for 30 days in fields containing cornstalks and weeds. Their gains during this period were small. They were then divided into four lots and fed for 60 days. Three lots were fed an average of 1 lb. of shelled corn daily and one lot 0.6 lb. All were fed alfalfa hay, but in two lots part of it was replaced by corn silage. In one lot a part of the shelled corn was replaced by corn silage.

The results indicate that it is more economical to limit the grain ration and to feed corn silage in connection with the alfalfa hay.

The agricultural situation for 1918.—I, Hog production should be increased (*U. S. Dept. Agr., Office Sec. Circ. 84 (1918), pp. 24, figs. 2*).—Attention is called to the increasing needs of pork products to meet home demands as well as those of our allies. While pork constitutes more than one-half of the meats produced in the United States it furnishes also large supplies of fats, the need for which is acute. During 1917 there was a decrease of 5,427,000 hogs, or about 7 per cent less than in 1916. The exports of pork products in 1917 were 1,417,000,000 lbs.

To meet the demands 15 per cent more hogs are needed. There was an increase in cereals during the year, much of which is available for pig feed, of 836,624,000 bu. To encourage feeding the U. S. Food Administration fixed a minimum price on hogs on the hoof at $15.50 per 100 lbs. at the stockyards.

To further the production of pork it is recommended to preserve breeding animals, to market hogs at heavier weights, to use self-feeders, and to feed more wastes, such as city garbage. Pig clubs, swine breeders' associations, and loans to pig feeders are indorsed.

The more common diseases of the hog are explained, special attention being given to the employment of the serum treatment for hog cholera.

Swine, E. S. ARCHIBALD ET AL. (*Canada Expt. Farms Rpts. 1916, pp. 560–573, 577–581, 583–597, pls. 4*).—At the Central Experimental Farm an experiment was carried out to determine the best method of feeding weanling pigs 10 weeks old or over during the summer. The pigs were divided into four lots of eight or nine pigs each and the experiment continued 84 days. Lot 1 received a mixture of equal parts of shorts, ground oats, and finely ground barley, plus skim milk. Lot 2 received the same feeds as lot 1 plus all the green clover they

would clean up. Lot 3 was fed whole barley in the hopper grinder, and as much each of equal parts of shorts and oats in a grain mixture as they consumed of the barley from the hopper grinder. They also received the same quantity of skim milk as lots 1 and 2. Lot 4 was fed a grain mixture of equal parts of shorts, finely ground oats, and finely ground barley fed in a self-feeder; also skim milk as in the other lots, but separately.

Lot 1 made an average daily gain of 1.06 lbs. per head, at a cost of 3.5 cts. per pound of gain; lot 2, 1.12 lbs. daily, at 3.51 cts. per pound; lot 3, 1.12 lbs., at 4.6 cts. per pound; and lot 4, 0.999 lb., at 3.58 cts. per pound. While the results show little difference in the use of the self-feeder, the fact that it required only half the time and labor as the usual methods of feeding indicates its possibilities.

An experiment was made at the same station with litters of young pigs from the time they began to eat until they were three months old, comparing linseed oil meal and tankage, skim milk and tankage, and single meals and a mixture of two or three meals with and without skim milk. The objects of the experiment were similar to those of the previous year (E. S. R., 36, p. 68), except that corn was the basis of the ration then while barley was, for purposes of economy, the basis in the present work. The experiment continued for 84 days. Lot 1, containing 10 Yorkshire pigs, on a ration of ground barley, shorts, and oil meal, 3 : 3 : 1, plus skim milk, made an average daily gain of 0.96 lb., at a cost of 2.97 cts. per pound of gain. Lot 2, 8 Berkshires, on a similar ration, except that one part of tankage was used instead of the oil meal, gained 0.66 lb. daily, at a cost of 3.93 cts. Lot 3, 8 Yorkshires, was fed a ration of finely ground barley and tankage, 6 : 1, plus skim milk, and made a daily gain of 0.97 lb., at a cost of 3.41 cts., while lot 4, 9 Berkshires, on the same ration, but without the skim milk, gained 0.52 lb. daily, at a cost of 4.1 cts. Lot 5, 11 Yorkshires, on a ration of finely ground barley plus skim milk gained 0.87 lb. daily, at a cost of 3 cts. per pound.

Compared with the experiment of the previous year there was little similarity in the total gains per lot, but in cost of gains there was more concordance. In this experiment oil meal gave better results than tankage, while in the previous experiments they were practically identical. As in the previous experiment, increased gains were shown by replacing the shorts with barley. The superiority of skim milk over tankage for economical gains is indicated.

An experiment was also made at the same station to compare the palatability, the digestible economy, and the gains made by pigs fed on various meals on the basis of protein content. The work was carried out with six lots of 5 pigs each, varying from 4 to 6 months of age, and with five lots from 2 to 3.5 months of age.

In the first experiment, lasting 56 days, the pigs were fed shorts, ground barley, and skim milk. In addition lot 1 received ground corn and made an average daily gain per head of 1.1 lbs. at a cost of 4.2 cts. per pound of gain; lot 2 with gluten feed made an average daily gain of 1.19 lbs. at a cost of 3.8 cts.; lot 3 with cottonseed meal, an average daily gain of 1.26 lbs. at a cost of 2.8 cts.; lot 4 with linseed oil cake gained 1.24 lbs. daily at a cost of 3.2 cts.; lot 5 with peanut oil meal, an average daily gain of 0.8 lb. at a cost of 4.3 cts.; and lot 6 with fish meal, an average daily gain of 1.1 lbs. at 4.7 cts. per pound.

In the second test, with younger pigs, the lot on fish meal was omitted. The other five lots were fed as before. Lot 1 on ground corn gained 1.15 lbs. daily at a cost to produce of 4.2 cts.; lot 2 on gluten feed gained 1.07 lbs. at a cost of 4.2 cts.; lot 3 on cottonseed meal gained 1.17 lbs., at a cost of 3.5

cts.; lot 4 on linseed oil cake gained 1.14 lbs., at a cost of 3.7 cts.; and lot 5 on peanut oil meal gained 1.11 lbs., at a cost of 3.5 cts.

In these experiments cottonseed meal, fed in proportion of 13.5 per cent of the ration, proved safe and gave the most economical gains. Linseed meal was practically equal to cottonseed meal. Peanut meal, while low in gains, showed up well in cost, due to the small amount necessary on a protein basis. Gluten meal compared closely with corn meal. Fish meal, while palatable, caused intestinal disturbances even though fed as only one-tenth of the meal ration.

In Manitoba, barley is the accepted standard feed for pig fattening. An experiment was carried out at Brandon to test the desirability of mixing other feeds with it. Four lots of pigs were used. Lot 1, containing 5 pigs, was fed barley; lot 2, 5 pigs, barley and feed flour, 3:1; lot 3, 4 pigs, barley and shorts, 3:1; and lot 4, 4 pigs, barley and oats in equal parts. In addition each animal in all lots was fed about 0.4 lb. of tankage daily.

Lot 1 made an average daily gain per head of 1.11 lbs. at a cost of 4.44 cts. per pound of gain; lot 2 a daily gain of 1.07 lbs. at a cost of 5.07 cts.; lot 3 a daily gain of 0.99 lb. at a cost of 5.08 cts.; and lot 4 a daily gain of 0.86 lb. at a cost of 6.18 cts. The previous year barley and feed flour had given the best results. In both years the barley and oats mixture was the most expensive and least satisfactory.

As skim milk is not usually available on Manitoba farms, an experiment was also undertaken at Brandon to find a succulent feed for young pigs to be used as a substitute. Mangels and potatoes, both raw and cooked, were tried, being fed with barley chop and shorts. The raw feeds were valued at $3 per ton and the cooked at $5. The cooked potatoes gave the best results both in gains and costs, while the raw potatoes were least satisfactory. The cooked mangels gave better results than the raw but not enough to pay for the cooking.

In another experiment raw and cooked mangels were compared with a straight grain ration. The raw mangels were about equally successful with the grain and better than the cooked mangels. The successful use of the raw mangels compared with grain apparently depends upon the cost.

At the Lacombe station, Alta, three lots of 5 pigs each, after being weaned at about 10 weeks of age, were fed 30 days on shorts and milk, shorts, and wheat. Those on shorts and milk gained 0.786 lb. each daily, at a cost of 3.71 cts. per pound of gain; those on shorts 0.42 lb., at a cost of 4.71 cts.; and those on wheat gained 0.373 lb., at a cost of 3.21 cts. These results are based on milk at 20 cts., shorts at $1.65, and wheat at $1 per 100 lbs.

Another experiment was carried out to test the value of different pastures in pork production. A basic ration of shorts, wheat, and skim milk was fed at the values quoted in the previous experiment to seven lots of 5 pigs each on different kinds of pasture and in a dry pen. The lot on pasture made up of wheat, oats, and barley made an average daily gain of 0.808 lb. per head at a cost of 3.5 cts. per pound to produce, on alfalfa pasture 0.808 lb. at a cost of 3.4 cts., on rape 0.778 lb. at a cost of 3.45 cts., on oats 0.795 at 3.41 cts., on barley 0.762 lb. at 3.51 cts., on wheat 0.661 lb. at 4 cts., while those in the corral gained 0.501 lb. daily at a cost of 5.3 cts.

Rations for pigs at weaning time, L. A. Weaver (*Missouri Sta. Bul. 151* (*1917*), *p. 29*).—Sixty-four pigs averaging 40 lbs. each were divided into eight lots, seven of which were pastured on rape and one on blue grass They were fed different additional rations.

From the results of the experiment during 112 days there was found little difference in the efficiency of the following rations: (1) Corn, shorts, bran, and tankage (4:4:1:1), (2) corn, shorts, and tankage (6:3:1), and (3) corn and tankage (9:1). Corn alone was not a well-balanced ration. Corn

and shorts, equal parts, was better than corn alone, but not equal to the above mentioned rations. Blatchford's pig meal and corn (1:2) was not as efficient as corn and skim milk (1:4). Skim milk was not so good as well-balanced grain rations with pigs on rape. The rape pasture was superior to the blue grass.

Digestion experiments with pigs, with special reference to the influence of one feed upon another, and to the individuality of pigs, H. S. GRINDLEY, W. J. CARMICHAEL, and C. I. NEWLIN (*Illinois Sta. Bul. 200, abs.* (*1917*), *pp. 4*).—An abstract of Bulletin 200 (E. S. R., 37, p. 677).

Mesquite beans for pig feeding (*New Mexico Sta. Rpt. 1917, pp. 77–82, fig. 1*).—Attention is called to the possibility of the greater utilization of the mesquite bean as a stock feed. The pods are sweet, and horses and cattle eat them eagerly. They should not be fed alone as they are constipating, but with wheat bran, alfalfa hay, or a succulent feed. They were not so well relished by pigs, but they were readily eaten when ground and mixed with milo maize meal, 2:1. With the milo maize worth $1.50 per hundredweight, the ground beans are worth about 80 cts. per hundredweight.

In a second experiment two lots of four pigs each were fed for 76 days on alfalfa hay and concentrates as follows: Lot 1, ground corn and ground mesquite beans, 1:1; lot 2, ground corn alone. During the first nine weeks the ground mesquite beans were about 75 per cent as efficient as ground corn. They were more efficient in the first period of the experiment than in the latter.

The results of the two experiments indicate that mesquite beans make an economical feed when grains are high. The digging up of the bushes should be discouraged unless a more valuable plant is available that will thrive under similar conditions.

Tankage for pigs (*New Mexico Sta. Rpt. 1917, pp. 75–77*).—Three lots of 12 pigs each, averaging about 60 lbs., were fed ground corn, ground corn and packing-house tankage, and ground corn and El Paso tankage. The standard or packing-house tankage contained 62.9 per cent protein and cost $3.60 per hundredweight, and the El Paso tankage, a local product, contained 47.7 per cent protein and cost $2.50 per hundredweight. The tankage-fed pigs received 15 per cent of the concentrate as tankage until they averaged 100 lbs. each and after that 10 per cent. The three lots were supplied at all times with alfalfa hay.

The cost per pound of gain of the corn fed lot was 11.34 cts., of the standard-tankage lot 8.76 cts., and of the El Paso-tankage lot 8.56 cts. The lots on tankage ate more with a better appetite and sold for 10 cts. per hundredweight higher on the El Paso market.

Inheritance investigation in swine (*Kansas Sta. Rpt. 1916, p. 19*).—The results of one year's work in swine inheritance indicate that the short dish-face of the Berkshire is transmitted as a dominant sex-linked characteristic. Statistical studies demonstrated (1) that the number of pigs per litter is not correlated with any of the characteristics of form which are commonly supposed to influence it; (2) that selection of dams and sires on the basis of the size of the litter in which they are farrowed has no effect on the immediate progeny nor on the second generation; and (3) that the method of fertility inheritance is extremely obscure.

Horses, E. S. ARCHIBALD ET AL. (*Canada Expt. Farms Rpts. 1916, pp. 506–531, pls. 6*).—Experimental work with horses at the different stations dealt largely with the cost of rearing and keeping.

At Charlottetown, P. E. I., two colts foaled in June and July were weaned October 30. During this time they received some feed in addition to their mothers' milk. From November 1 to March 31 they were fed hay, roots, and

a variety of concentrates. The average cost of feed during the first period was 3.8 cts. per day and during the second period 12.4 cts. per day.

At Kentville, N. S., the average cost of feeding six work horses from April 1 to December 1 was 44.98 cts. per horse per day, and from December 1 to April 1, 32.52 cts.

At Cap Rouge, Que., from a summary of experiments for five years, from 1911, it is stated that idle horses can be wintered on a daily ration of 1 lb. of rough hay, 1 lb. of oat straw, and 1 lb. of roots (swedes or carrots) for each 100 lbs. of live weight. With hay at $7, straw at $4, and roots at $2 per ton, a horse of average weight (1,280 lbs.) and idle can be kept for 9.5 cts. per day. At this station it was found that, while it took more feed to winter horses outside, the larger cost was more than compensated for by the continued good health of the animals in the open air.

At Lennoxville, Que., two mares were wintered on a ration of 20 lbs. of roots and 27 lbs. of hay each at a cost of 17.5 cts. per head per day, while two others were wintered on a ration of 4 lbs. of oats, 2 lbs. of bran, and 27 lbs. of hay at a cost of 21.5 cts. per day. Although the light grain ration made a little larger gain in weight than the root ration, the latter is recommended for the more economical wintering of horses.

At the Brandon, Man., experimental farm seven working horses were successfully wintered in a corral with an open shed for shelter. They were fed 4 lbs. of grain daily with straw for roughage.

At Indian Head, Sask., one lot of idle horses fed on bran and oat chop with the run of a straw stack during the day and stabled at night were wintered at a cost of 5.2 cts. per horse per day. Others fed the same ration and hay in addition, and stabled, cost 10.75 cts. per day. With light winter work the cost of keeping horses on the same ration was 26.75 cts. per head per day.

At Scott, Sask., the cost of wintering mature horses from 9 to 12 years old was 5.6 cts. per day, rising 4-year-olds, 6.8 cts., and rising 3-year-olds, 7.9 cts. The cost of feeding a pair of geldings at work during the winter was 13.9 cts. per horse per day.

At Lacombe, Alta., the horses are largely wintered in the open and fed on hay and grain at a cost of 11.47 cts. per day. The straw stack in the corral has not given as good returns as the straw stack in the open field where the horses have access to grass also.

The physiological effect upon work horses of alfalfa hay cut at different stages of growth (*Kansas Sta. Rpt. 1916, pp. 16, 17*).—A continuation of work previously noted (E. S. R., 36, p. 171).

The leaves of alfalfa contain from two to two and one-half times as much protein as the stems, while the latter contain two and one-half times as much crude fiber as the leaves. The loss of leaves in harvesting increases with maturity. The largest yield per acre was obtained when the alfalfa was cut while in full bloom. The percentage of ash and protein decreases as the plant matures, while the crude fiber and nitrogen-free extract increase. There was a sufficiently greater amount of protein in the alfalfa cured in the sun to more than offset the larger loss of leaves over that cured in the shade.

Corn silage as a part ration for horses of various ages, E. A. Trowbridge and E. H. Hughes (*Missouri Sta. Bul. 151 (1917), pp. 26, 27, fig. 1*).—Mature light mares and growing light horses were maintained 84 days on a daily ration of 5 lbs. alfalfa hay and all the silage they would eat. The four mares consumed an average of 15.11 lbs. of silage daily and lost 35 lbs. each for the feeding period. The growing horses, including yearlings and two and three year olds, consumed 15.9 lbs. silage daily and lost slightly in weight. From the results it

seems that alfalfa hay and silage make a cheap ration for horses not at work during winter.

Report from the poultry division for the year ended March 31, 1916, F. C. Elford et al. (*Canada Expt. Farms Rpts. 1916, pp. 1301–1379, pls. 16*).—A report of work with poultry carried on at 13 stations and farms located in various Provinces of the Dominion of Canada.

For several years prior to 1909 Canada exported poultry products, but from 1909 to 1914 the country not only had nothing to export but had to import both eggs and dressed poultry. In 1914 a small surplus was exported, and in 1915, following the "Patriotic Campaign for Greater Production," the exports exceeded the imports by $1,842,858.

A farmer's poultry house is illustrated and specifications given.

A test was made to determine whether eggs could be shipped after being in the incubator long enough before shipping to show that they were fertile. Five shipmnts in lots of 15 were made from Ottawa to Winnipeg after the eggs had been incubated for 4, 6, 9, 11, and 12 days, but it was found that all eggs were dead upon arrival. Poultry survey work was carried on with two groups of farmers in Quebec and Ontario, and some pen records are given.

At the Kentville Station natural incubation gave a 73.1 per cent hatch of fertile eggs, while artificial incubation gave only 61 per cent. At the Nappan Farm natural incubation averaged 49.1 per cent hatch, with 90.5 per cent alive at the end of the eighth week, while artificial incubation averaged 21.2 per cent with 57.4 per cent alive at the end of the eighth week.

At the Brandon Farm shipping breeding eggs was compared with shipping day-old chicks for distances of 1,000 and 1,300 miles. Better results were obtained by hatching breeding eggs at their destination than by shipping day-old chicks. At the Lacombe Station, out of 98 eggs shipped from Brandon 11 chicks were alive at one month of age, while from 50 day-old chicks only one was alive after one month. Out of 99 eggs shipped from Agassiz, there were 60 chicks alive at one month of age, while from 75 day-old chicks 64 were alive after one month.

In an experiment at Agassiz comparing early and late hatched pullets of two breeds, the cost of eggs per dozen and per pound was found slightly higher with the late hatched. In another experiment comparing Barred Rock pullets with 1-year-old-hens, the former produced eggs at a cost of 15.64 cts. per dozen, or 10.45 cts. per pound; the latter at 18.63 cts. per dozen, or 11.98 cts. per pound. With White Leghorns, the pullets produced eggs at a cost of 14.35 cts. per dozen, or 9.69 cts. per pound; as compared with 16.73 cts. per dozen, or 10.35 cts. per pound, for the 1-year-old hens. In a test to determine the length of time eggs would remain fertile after removal of the male, there was a drop beginning on the sixth day, amounting to 50 per cent on the tenth day, and reaching 16.6 per cent on the fifteenth day, after which all were infertile.

In a test of rice as a ration for young growing chicks it was found that all the birds fed on unmilled boiled rice soon became anemic and two of them died, those of a second lot fed on milled rice also became anemic and all died before the expiration of the experiment, while those on high-grade rice shorts developed the same symptoms after a somewhat longer period. Similar results followed the continued feeding of boiled whole rice to ducklings.

Preliminary report of the first year (pullet year) of the Vineland international egg-laying and breeding contest, H. R. Lewis (*New Jersey Stas. Hints to Poultrymen, 6 (1918), No. 4, pp. 4*).—A progress report is given of the first year's performance at the Vineland contest.

In spite of an epidemic of chicken pox which attacked practically every pen on the contest plant during September and October, the average egg production

per bird was 161.8 eggs, or a 44.4 per cent lay. The 1,000 birds weighed 2.06 tons, and they produced 10.1 tons of eggs, the average weight per egg being 2.01 oz. To do this the birds consumed 41,312.1 lbs. of mash and 38,247.9 lbs. of grain, or an average consumption of 79.56 lbs. of feed per hen. With mash at \$2.70 and grain \$3 per hundredweight, the feed cost was \$2.26 per bird. It required an average of 3.9 lbs. of feed to produce 1 lb. of eggs, but in the highest producing pen, which averaged 221.2 eggs per bird, it required but 2.9 lbs. of feed to produce 1 lb. of eggs. On the basis of 45.4 cts. per dozen for brown eggs and 50.2 cts. per dozen for white eggs, the contest birds earned an average of \$6.06 each. Deducting from this the cost of feed, there was a net return per bird of \$3.80. With an additional charge of \$1.50 for labor, interest, depreciation, insurance, and other overhead charges, there was a net profit of \$2.30 per bird.

The number of eggs per bird for the different breeds was 169.7 for the Leghorns, 155 for the Plymouth Rocks, 150.6 for the Rhode Island Reds, and 144.3 for the Wyandottes. The actual returns above feed per bird varied from \$2.91 for the Plymouth Rocks to \$4.30 for the Leghorns. There were 10 hens in the contest that laid 265 or more eggs each during the year, the highest-producing hen being a White Plymouth Rock which laid 301 eggs.

Poultry experiments (*New Mexico Sta. Rpt. 1917, pp. 87–91*).—The results of a three months' feeding experiment with ground oats, shorts, bran, beef scrap, and cottonseed meal are reported. They indicate that there are possibilities in cottonseed meal as a poultry feed.

Very early hatches pay best, Mr. and Mrs. G. R. Shoup (*Washington Sta., West. Wash. Sta. Mo. Bul., 5 (1918), No. 10, pp. 152–155*).—In three seasons' experiments at this station the early hatching of chickens gave the best returns. The scarcity of good hatching eggs early in the season is the greatest drawback. The lighting of the houses and the feeding have an influence on forcing early laying.

In 1917 the February 1 hatch consisted of 160 pullets and the April 1 hatch of 320. The cost of the former to 6 months of age was \$1.02 each and the latter \$1 each. The net profit per bird to December 1 was \$1.75 for the February hatch and 74 cts. for the April hatch.

Poultry on the farm, J. E. Dougherty (*California Sta. Circ. 186 (1917), pp. 4*).—A general discussion of returns to be expected from poultry under average farm conditions in California. Suggestions as to feeds, feeding, and housing are incorporated.

DAIRY FARMING—DAIRYING.

Dairy cattle, E. S. Archibald et al. (*Canada Expt. Farms Rpts. 1916, pp. 423–505, pls. 7*).—Corn silage was compared with a soiling crop of peas and oats as supplements to a grain mixture for summer feeding of milch cows. This test was conducted in three tri-weekly periods, during the first and third of which silage was fed and during the second peas and oats. On the peas and oats ration the 18 cows produced 7,947.5 lbs. of milk containing 300.32 lbs. of fat, and their average production during the two periods on silage was 7,744 lbs. of milk containing 304.15 lbs. of fat. However, the cost of the green feed fed was \$25.70 and of the silage an average of \$5.29.

A comparison was made of the relative value, palatability, and economy of linseed meal, cottonseed meal, gluten feed, fish meal, and peanut meal for milch cows. Mixtures of these protein feeds with bran and ground oats were fed so that the cows received the same number of pounds of protein in each period. The concentrates were supplemented with turnips, silage, and hay. In

the quantities used the cows ate each of the grain feeds very readily. The order of economy and value of these protein feeds was as follows: Linseed meal, gluten feed, cottonseed meal, peanut meal, and fish meal. The costs per ton were, respectively, $38, $32, $33, $40, and $80. It is stated that although fish meal is too expensive for profitable feeding to dairy cattle in large quantities, it might be used to advantage in small quantities on account of its tonic effect.

In continuation of previous work (E. S. R., 36, p. 75), whole milk was compared with various grain substitutes with and without skim milk and buttermilk for raising calves to six months of age. These experiments have shown the great economy of feeding a good homemade calf meal with a dairy by-product, and indicate that buttermilk is slightly superior to skim milk as a supplement to calf meal.

The feed cost of raising 20 heifers to about 6 months of age varied from $10.59 to $39.12 per head; of raising 15 heifers to 12 months of age, from $16.42 to $48.42; and of raising 9 heifers to 24 months of age, from $29.13 to $47.92. In this test the most expensive gains were made where whole milk was fed during the first 5 months.

In a test of a number of proprietary fly repellents some of the repellents were fairly efficient. It is noted that where these sprays were used there was a complete absence of warbles on the cattle, whereas unsprayed cattle on adjoining pastures were heavily infested with warbles.

Further tests with five different makes of milking machines indicate that, taking good hand milking as representing 100 per cent thoroughness in milking clean, the efficiency of the machines varied from 91.59 to 87.46 per cent.

The ordinary single-jacket milk can was compared with an insulated double-jacket can for shipping milk a distance in warm weather. With milk cooled on eight days in July to an average of 38.2° F. at 6 a. m. and shipped by wagon, the average temperature 2.5 hours later at the city was 47.4° in ordinary cans and 40.1° in insulated cans.

The average cost of raising 4 Shorthorn heifers to 12 months of age, when they averaged 625 lbs. per head, was $36.55. Two Shorthorn heifers cost to the calving period $89.83 and $96.21, respectively. Detailed data are given of the cost of raising a bull calf largely with skim milk during the first 6 months, as compared with one which was allowed to suckle the cow. The skim-milk calf at 320 days of age weighed 580 lbs. and had cost $31.63, whereas the other calf at the same age weighed 775 lbs. and had cost $78.20. In this test whole milk was valued at 4 cts. per quart and skim milk at 20 cts. per 100 lbs.

Four lots of from 3 to 4 10-week-old calves each were fed until they were 3 months of age. Lot 1 received whole milk; lot 2 skim milk with a grain mixture of oats, corn meal, and linseed meal (2:4:1); lot 3, a commercial calf meal and water; and lot 4, the same calf meal and skim milk. The average daily gains per head were 2.14, 1.82, 1.31, and 1.82 lbs. for the respective lots. With oats $40, corn meal $38, linseed meal $40, calf meal $80, whole milk $25, skim milk $4, silage $2, and hay $7 per ton, the average cost per pound of gain was 10.8, 4.05, 6.9, and 4.18 cts. for the respective lots.

In another test the cost of raising 7 dairy heifers to 6 months of age on whole milk, skim milk, grain, hay, and roots varied from $26.88 to $37.82.

To ascertain the proper quantities of grain to feed with hay, silage, and swedes a number of dairy cows were fed from November to March each year for three years. The animals in lot 1, which received all the meal they would clean up (averaging 1 lb. per 2.19 lbs. of milk), were fed at an average cost of $24.43, and gave a profit of $15.94 per cow per year. Lot 2, fed 1 lb. of meal to 4 lbs. of milk, averaged in feed cost $17.47 and in profit $14.79 per cow per year.

Lot 3, which received 1 lb. of meal to 8 lbs. of milk, was fed at an average cost of $13.96 and made a profit of $15.08 per cow per year.

The cost of raising 3 French-Canadian heifers to 18 months and 10 days, when they weighed 728 lbs., averaged $52.39 each. In another test the feed cost of raising a dairy heifer from birth to 1 year, on whole milk, skim milk, grain, roots, and hay, was $33.46. Another heifer cost $25.95 to feed from 1 to 2 years of age, and another $30.02 from 2 to 3 years of age.

Five lots of from 16 to 20 cows were fed as follows: Lot 1, roots, 1 lb. per pound of milk, and timothy hay and oat straw; lot 2, peas and oats as silage and oat straw; lot 3, peas and oats, 75 per cent as silage and 25 per cent in green sheaves, and oat straw; lot 4, peas and oats silage and prairie hay (3:1) and oat straw; and lot 5, peas and oats silage and timothy hay (3:1) and oat straw. The average cost of producing 1 lb. of butter was 19.7, 16.7, 22.5, 20.4, and 22.6 cts., respectively.

A number of pure-bred Holstein heifers were raised to 7 months of age largely on skim milk, grain, roots, silage, and hay, with some whole milk during the first two months. During this time the average feed cost was $19.65 per calf and the average daily gain 1.78 lbs.

In continuation of previous work (E. S. R., 36, p. 77) 4 lots of calves were fed as follows, in addition to a grain ration: Lot 4, whole milk; lot 5, skim milk; lot 6, linseed cake; and lot 7, a commercial calf meal. These calves made average daily gains per head of 1.91, 1.61, 0.7, and 0.77 lb. at a cost per pound of gain of 14.42, 5.49, 13.02, and 9.55 cts. It was noticed during the year that calves fed three or four times per day while young gave better returns than those fed twice per day.

In a comparison of open shed *v.* stable for senior yearling heifers during a long and severe winter in British Columbia those in open sheds gained 0.38 lb. and those in stable 0.6 lb. per head daily. The average feed cost per pound of gain was 27.9 and 16.4 cts. and the feed and housing cost per heifer $18.21 and $25.07, respectively.

Clover silage proved a valuable substitute for corn silage for dairy cows. Oat and barley straw, when it could be obtained cheaply, was an excellent form of roughage as compared with mixed hay. Field carrots produced good succulence for dairy cattle and are recommended for dairymen who can not successfully grow mangels.

From a comparison of watering twice a day with keeping water before the stock, it is concluded that "the ad libitum system of watering dairy cattle has certain outstanding advantages over other systems, but not altogether from the point of increased production."

[Feeding experiments with dairy cows], J. J. Hooper (*Kentucky Sta. Rpt. 1915, pt. 1, pp. 24, 25*).—A report of experiments on the feeding value of osage oranges for dairy cows has been noted from another source (E. S. R., 36, p. 374). One cow was fed 226 lbs. of osage oranges from February 4 to March 1, in addition to silage, corn meal, and bran. No effect was noted on the milk yield, taste of milk, or the yellowness of the cream. On account of a liberal protein content and the further fact that the oranges are succulent it is thought that they may become of considerable economic importance in winter feeding.

The feeding of 10 cc. of liquid cheese or butter color to another cow during February failed to increase the yellow color of the cream.

Feeding dairy cattle, R. L. Shields (*South Carolina Sta. Rpt. 1917, pp. 14–16*).—A comparison was made of cottonseed meal and velvet bean meal, supplemented by wheat bran, corn silage, and corn stover, for dairy cows. Two cows were fed for 56 days by the reversal method, the concentrates consisting of cottonseed meal and wheat bran (2:1) and velvet bean meal and

wheat bran (2:1), 1 lb. of concentrates being fed for each 3 lbs. of milk produced. The velvet bean meal was not eaten with relish at first, but after the preliminary period each cow ate all the velvet bean meal given her, though there was a variation in appetite.

No material difference was noted in the effect of the two rations on the weight of the cows. A slightly better milk flow was maintained by the cottonseed meal ration. The butter produced by the velvet bean meal ration was somewhat the softer and whiter and the grain finer. Analyses are given of the velvet bean meal and cottonseed meal used in the test.

In a comparison of linty and lintless cottonseed hulls for dairy cows no difference was noticed when the two kinds of hulls were fed in a dry condition. When the lintless hulls were thoroughly soaked in water before feeding there was a slight increase in milk flow in their favor.

Roughages for milk production, C. C. Hayden (*Mo. Bul. Ohio Sta.*, *2* (*1917*), *No. 12*, *pp. 387–390*).—The importance of home-grown leguminous roughages as a means of reducing feed cost on dairy farms under present conditions is emphasized. Experiments already reported (E. S. R., 32, p. 265) on the value of soy-bean and alfalfa hay for dairy cows are summarized.

[Sudan grass pasture for dairy cows] (*New Mexico Sta. Rpt. 1917*, *pp. 71–74*).—A 7-acre plat seeded April 19 to Sudan grass was divided into two parts, and after 60 days 12 cows were turned on one of the fields. After a few days it was found that 12 cows were not sufficient to catch up with the growth the pasture was making, and 8 more cows were added for 12 days. The two fields were irrigated and pastured alternately during the season, the change being made at intervals of about two weeks. Heavy rains came about the middle of October, making these fields too muddy for use, and the cows were given a small grain ration, averaging 4 lbs. per head. The 12 cows were divided into two lots, and the grain ration was alternated from one lot to the other every 30 days.

The results of this part of the experiment indicate that it does not pay to feed a grain ration to cows running on good pasture. During the four months that the cows were on pasture they gained an average of 19 lbs. per head, and gave 27,422.5 lbs. of milk, which contained 1,096.9 lbs. of milk fat. The 8 dairy and beef cows that were temporarily on the pasture gained 18 lbs. per head in 12 days. The pasture carried an average of 2 cows per acre for four months. There was no indication of poisoning by pasturing this grass in November after the frost came. The results of this test indicate that Sudan grass should prove to be a valuable supplement to permanent pastures during the summer under dry-land conditions.

Winter rations for dairy heifers, C. H. Eckles and W. W. Swett (*Missouri Sta. Bul. 151* (*1917*), *p. 36*, *fig. 1*).—In this experiment, which has been under way for four years and has involved 50 heifers, it has been found that heifers receiving a ration of silage and timothy hay will be maintained but will make very little gain in weight during the winter. Gains much above the normal may be had by feeding liberally with concentrates, but this greatly increases the expense of raising the animals. Where summer pasture is relatively cheap and grain high the economical plan is to feed the animals a ration composed largely of roughage during the winter and to keep them in a moderate condition. Under this plan of feeding a large part of the growth is made from pasture, but the animal may be somewhat slower to mature. The most practical ration for Missouri conditions is silage and a legume hay for roughage, with a grain allowance of about 2 lbs. daily.

Unfavorable rations exert a much more pronounced effect upon the growth as represented by weight than upon the skeleton growth. Unless the rations

are rather extreme in character the rate of skeleton growth is not affected appreciably.

Influence of nutrition of heifers and age of breeding upon their subsequent development, C. H. ECKLES and W. W. SWETT (*Missouri Sta. Bul. 151* (*1917*), *p. 33*).—A progress report of investigations upon the normal growth and protein requirements of growing animals (E. S. R., 35, p. 871).

The growth records as shown by weight and height measurements in these experiments are proving of great value in connection with other investigations. The data obtained in the study of protein requirements for growth indicate that a ration in which about 15 per cent of the energy is from protein is sufficient for normal skeleton growth, but possibly a little deficient for the best standard as measured by gain in weight. Little difference has so far been noted in the efficiency of protein from skim milk as compared with protein from a mixed ration. Confirming previous results, it has been found that unfavorable conditions exert their effects much more on growth as represented by weight than on growth as represented by the development of the skeleton.

Factors influencing the composition of milk, C. H. ECKLES, L. S. PALMER, and W. W. SWETT (*Missouri Sta. Bul. 151* (*1917*), *pp. 33–35*).—Progress reports are given on the following investigations:

I. *Cottonseed meal and cottonseed by-products* (pp. 33, 34).—Previously noted from another source (E. S. R., 37, p. 72).

II. *The cause of the counteracting influence of corn silage when fed with cottonseed meal* (pp. 34, 35).—Continuing earlier work (E. S. R., 37, p. 72), corn silage in the rations of two cows was replaced with alfalfa hay which had been treated with lactic acid equivalent in amount and concentration to that found in silage. The results gave substantial evidence that the lactic acid in silage is responsible for the counteracting effect which silage has on milk fat when fed with cottonseed meal. In the second experiment the silage in the rations was replaced by timothy hay treated with lactic acid. The results were entirely negative, but it is noted that great difficulty was experienced in causing the timothy hay to absorb the lactic acid. In a third experiment the effects of replacing silage with sugar were noted. Commercial glucose sirup equivalent to the glucose contained in the silage fed in the first experiment was fed before the typical silage fermentation had taken place. The amount was calculated from the acid contained in the silage. The hay fed in the sugar period was a mixture of equal parts of alfalfa and timothy. The results secured were entirely negative, except that they confirmed observations on the effects of feeding cottonseed meal. The fat constant during the period of glucose and hay showed only the effects of the cottonseed meal in the ration.

III. *Influence of condition at parturition on the composition of the milk and butter fat* (p. 35).—Only one cow was under observation in this investigation during the year (E. S. R., 37, p. 172). This cow calved in July, 1916, at a slightly lower body weight than in 1915. She was continued on the same plane of protein intake with the same ration with the exception of silage, and she produced milk and milk fat of the same general composition as during the previous year. The protein averaged about 3 per cent and the milk fat slightly less than 3 per cent; the constitution of the milk fat showed a high saponification value, a high Reichert-Meissl number, and a low iodin value. After she had been in milk 90 days the protein in her ration was increased from a little more than 1 lb. to practically 2 lbs. a day. This caused a marked improvement in the physical condition, a gain in body weight, and an increase of several pounds in the milk flow. The percentage of protein in the milk

increased to 3.5 per cent and the fat to 5 per cent. The constitution of the milk fat also became normal, but this was probably not due to the change in ration, as the same change occurred in 1915 without a similar change in ration.

A study to determine the cause of gummy body commonly characteristic of butter produced in the South, noting especially the influence of various rations on texture and flavor, R. L. Shields, J. A. Raitt, and G. F. Lipscomb (*South Carolina Sta. Rpt. 1917, p. 16*).—The results of the experiment indicate that "cottonseed meal products, if fed moderately, as they should be fed, do not produce sticky or gummy butter. . . . Cottonseed products, even if fed in limited amounts, tend to increase melting point of butter; wheat bran, peanut meal, and velvet bean meal tend to lower melting point of butter. Amount of working, richness of cream, and churning temperature have no effect on gummy quality of butter. Pasteurization of cream destroys gumminess of butter to some extent."

Stage of lactation affects milk yield, R. I. Grady (*Mo. Bul. Ohio Sta., 2 (1917), No. 12, pp. 401–406, figs. 2*).—Data from the yearly milk records of 96 Jerseys and 96 Holsteins are summarized in order to show the effect of the stage of lactation on the yield and quality of milk.

During the first eight months of lactation the Jerseys decreased in milk yield from 4 to 8 per cent per month, based on the yield of previous months. The Holsteins during this period decreased from 2 to 10 per cent. The total decrease for this period was, for the Jerseys, 47 per cent in milk yield and 42 per cent in fat yield, and for the Holsteins, 49 per cent in milk yield and 47 per cent in fat yield. After the eighth month the decrease in milk flow was much more rapid, the average for both breeds being about 12 per cent per month. The fat content of the milk varied very little during the first four months of lactation. After the fourth month the percentage of fat gradually increased. The percentage of fat in the milk of the Jerseys was 15.5 per cent higher and of the Holsteins 8.1 per cent higher in the tenth month than in the first month.

To show how different cows vary in the changes that occur in milk flow, five cows of each breed that made but small changes in their milk flow from month to month were compared with five cows from each breed that varied greatly from month to month. It was found that the average monthly decrease of the persistent milkers was 3 per cent, and of the short milkers 9.8 per cent, during the first six months of the lactation period.

Marketing Wisconsin milk, B. H. Hibbard and H. E. Erdmann (*Wisconsin Sta. Bul. 285 (1917), pp. 71, figs. 14*).—In this report of a study of conditions surrounding the marketing of milk in a number of cities and towns in Wisconsin the authors discuss the consumption of milk in the State, grades of milk, health regulations affecting the marketing of milk, bases for payment to farmers, markets for Wisconsin whole milk, direct and indirect marketing, market organization among the milk producers, prices and price making, the relation of price to cost of production, and the condensed milk and powdered milk industries.

The cost of direct delivery of milk by seven producers varied from 1.27 to 2.38 cts. per quart. The average of five of these men who were retailing chiefly their own milk and selling relatively little at wholesale was 1.59 cts. per quart, while for two retailing bulk milk the cost was 1.28 cts. per quart. The cost of distribution in indirect marketing of milk varied from 1.22 to 3.61 cts. per quart. It is estimated that for moderate-sized plants the cost of preparing and distributing milk prior to the unusual rise of prices of 1916 was slightly over 2.5 cts. per quart. On the basis of 6.478 cts. per quart it is estimated that the total costs were distributed as follows: Amount paid farmer, 3.276 cts.; transportation, 0.489 ct.; handling at plant, 1.172 cts.; and delivery, 1.541 cts.

A brief report is made of an experiment in two Chicago districts, in which present methods of milk delivery were compared with a trial systematized, or unified, delivery. In one of these districts, under present methods, 336 bottles of milk were delivered in 337 minutes by eight different men representing six companies. Under the unified experimental delivery this milk was delivered at the rate of 1.87 bottles a minute, or about 54 per cent of the time taken by the present system. In the other district the efficiency of the present method as compared with the trial delivery was just under 55 per cent. It is estimated that under a unified system of milk delivery only 37 per cent of the horses now used would be required. Other economies in such a delivery system are pointed out.

VETERINARY MEDICINE.

[Report of the veterinary department], J. W. Connaway, A. J. Durant, and H. G. Newman (*Missouri Sta. Bul. 151* (*1917*), *pp. 59–61*).—In continuation of hog cholera immunity studies (E. S. R., 37, p. 779) investigations were made of the duration of infectiousness of the blood of swine which have been treated by the serum-virus method. Forty-six pigs were treated with the blood taken from 9 immunized in this way, and it was found that the blood was regularly infectious for 8 days after immunization; that there was a variation in the infectiousness after the eighth day; and that the infectiousness ceased after the seventeenth day. It is thought, however, that the inoculation of larger doses of the blood would probably show the presence of active virus for a period longer than 17 days.

Studies made of the intra-vitam contamination of the blood of swine by tubercle bacilli furnish proof of the possibility of transmitting tuberculosis of the bovine type by blood inoculation from infected to other swine and to rabbits and guinea pigs, as well as from rabbit to rabbit.

In investigations of contagious abortion, 52 of 73 suspected herds of cattle were found to be infected with contagious abortion. Of the 1,471 cattle tested, 516 gave positive reactions to the abortion test and 955 negative. Tests of blood samples from 29 pure-bred brood sows in four herds in which contagious abortion was suspected showed positive reaction to the complement fixation test in 21 of the 29 tested.

Peptone-free media for routine culture work, N. S. Ferry and A. Noble (*Jour. Lab. and Clin. Med.*, *3* (*1918*), *No. 5*, *pp. 298–300*).—Trials with ten different media without peptone, part of them neutralized and part made 1 per cent acid, showed that for organisms which grow readily on standard plain agar, neutral veal or beef media without peptone can be substituted.

Serum veal agar: A dependable substitute for ascitic or blood agar, N. S. Ferry and A. Noble (*Jour. Lab. and Clin. Med.*, *3* (*1918*), *No. 5*, *pp. 295–297*).—The authors have found that ascitic or blood agar may be successfully replaced in most cases by a veal agar (neutral to phenolphthalein) to which has been added normal horse serum. A formula for the medium is given.

[The Abderhalden blood test], L. R. Himmelberger and W. S. Anderson (*Kentucky Sta. Rpt. 1915*, *pt. 1*, *pp. 25*, *30*, *31*).—The Abderhalden blood test was made on a number of brood mares and it was found that pregnancy can be determined in 80 cases out of 100. It is believed that with more experience the test will become almost infallible.

Owing to the fact that dialyzers could not be obtained, a modification of the original method was employed, the serum proteins being precipitated out by chemical means as follows: The placental protein and serum were placed in a test tube covered with toluol and incubated for 16 hours. The contents of the

tube were then filtered and treated successively with dilute acetic acid, ammonium hydroxid, and a saturated solution of ammonium sulphate, filtering after the addition of each reagent. The final filtrate was tested with 0.2 cc. of 1 per cent solution of triketohydrinden hydrate.

Eupatorium urticæfolium as a poisonous plant, C. D. Marsh and A. B. Clawson (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 13, pp. 699–715, pls. 4*).—The authors here report upon feeding experiments in Illinois and at Washington, D. C., with the plant commonly called snakeroot and also known as richweed.

The results substantiate those obtained by Curtis and Wolf (E. S. R., 37, p. 583), and show conclusively that it is toxic for cattle and sheep as well as other animals, producing a definite line of symptoms bearing close resemblance to those characteristic of the disease known as milk sickness, trembles, etc. The authors conclude that probably many, possibly most, cases of trembles in cattle and sheep are due to poisoning by this plant. It is stated, however, that under the term "milk sickness" or "trembles" are probably grouped at least two distinct affections, one poisoning by *E. urticæfolium* and the other a bacterial disease.

A list of 14 references to the literature is included.

Gossypol, the toxic substance in cotton seed, W. A. Withers and F. E. Carruth (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 2, pp. 83–102, pl. 1, figs. 3*).—In continuation of investigations previously reported (E. S. R., 34, p. 381) the authors present the results of comparative experiments with an isolated and purified gossypol fed to various animals. The results have led to the following summary:

"Raw cottonseed kernels contain about 0.6 per cent of gossypol and are highly toxic to rats. Ether extraction renders the material nontoxic and gives a highly toxic extract containing about 2 per cent of gossypol. Gossypol fed in milk diets in amounts equivalent to those contained in the raw cottonseed diets has proved as toxic as raw cottonseed. Gossypol may be quantitatively removed from the ether extract by precipitation as its insoluble anilin compound. The extract is thus rendered nontoxic to rats. The insoluble anilin compound of gossypol is not toxic because of its insolubility. Gossypol prepared from this compound possesses its original toxic properties.

"Cottonseed meal is much less toxic than raw cotton seed, owing mainly to the oxidation of gossypol during cooking. Cottonseed meal, ether-extracted cotton seed, and gossypol have been fed to small pigs in pens under comparable conditions. Cottonseed meal has been found definitely injurious, while the ether-extracted raw seed does not appear to cause cottonseed-meal poisoning. Gossypol has been found toxic to pigs.

"If the presence of an injurious substance in the meal is disregarded, a diet of cottonseed meal and corn meal has nutritive limitations which may, under restricted conditions of living, lead to failure of pigs to thrive. Such failure is a phenomenon distinct from cottonseed-meal poisoning.

"Outdoor exercise, access to forage and soil, and improved diets tend to postpone or avert cottonseed-meal poisoning of swine. The deficiency hypothesis that cottonseed-meal poisoning of swine is similar to beriberi is untenable."

A list of 19 references to the literature cited is appended.

The solvent action of antiseptics on necrotic tissue, H. D. Taylor and J. H. Austin (*Jour. Expt. Med., 27 (1918), No. 1, pp. 155–164, pl. 1*).—The solvent action of Dakin's solution on necrotic tissues was compared with that of other chlorinated antiseptics, including chloramin-T, dichloramin-T, and chlorinated paraffin oil and eucalyptol, by adding 50 cc. of each solution to 5 cc. of an emulsion of macerated liver tissue, shaking the mixture thoroughly

every half hour for two hours, and measuring the amount of sediment remaining after centrifugation. From the experimental data obtained the following conclusions were drawn:

Dakin's hypochlorite solution has the power of dissolving necrotic tissue, pus, and plasma clot in the concentration and reaction used clinically, but the other antiseptics tested do not show this action. The solvent action of Dakin's solution is due primarily to its hypochlorite content, but its slight alkalinity increases the effectiveness of the hypochlorite. The hypochlorite concentration at which the solvent action ceases is lower the more alkaline the solution, and in the degree of alkalinity used clinically the minimum concentration for solvent action is about 0.2 per cent. None of the antiseptics studied has a solvent action on blood clot.

These results do not support the clinical observations of Sweet (E. S. R., 37, p. 876) and others that the more recent and more stable chloramins are more effective in dissolving dead tissues than the older chlorin compounds. The greater solvent action of Dakin's solution the author assumes to be due to its greater instability.

Methods of controlling blackleg developed by the Kansas State Agricultural College, L. W. Goss (*Kansas Sta. Rpt. 1916, pp. 44–49*).—As a result of investigations continuing those previously noted (E. S. R., 36, pp. 180, 578), "a serum has been produced from the horse which will stop immediately the losses in a herd in which calves are dying from blackleg. Also, a germ-free fluid vaccine or aggressin has been produced from calves, which when used upon healthy calves will produce a more durable immunity against blackleg."

The serum is prepared by five successive injections, from 7 to 10 days apart, of pure cultures of *Bacillus chauvœi* into the jugular vein of a horse. Nine days after the last injection a sample of blood is drawn and 0.55 cc. of the clear serum injected subcutaneously into each of three guinea pigs which are 15 hours later injected subcutaneously with 125 mg. of dried muscle from a blackleg lesion of a calf. If the test is satisfactory the horse is bled upon the third day and the clear serum bottled after the addition of 0.5 per cent of phenol. The serum produces only a passive immunity, but active immunity may be acquired by following the serum inoculation in three days with from 4 to 8 mg. of a virus made from the darkest meat of a blackleg lesion of a calf. This is ground, passed through an 80-mesh sieve, and made into pellets which are then attenuated at 60° C. for an hour to kill nonspore-forming organisms.

The germ-free fluid vaccine or aggressin is made by the inoculation of calves with muscle virus in doses of 1 gm. or by the use of from 20 to 30 cc. of pure cultures of *B. chauvœi.* After the death of the calf the affected tissue is removed, ground, frozen, thawed, and filtered through infusorial earth filters. The filtrate is sterilized with 0.5 per cent of phenol or 1 per cent of chloroform and tested for potency and sterility by subcutaneous inoculation of guinea pigs with 10 cc. of the vaccine.

The blackleg serum is curative in the early stages of the disease and will check outbreaks within 12 to 24 hours. The germ-free vaccine will not cure blackleg but will produce immunity within four or five days after inoculation. This immunity is of longer duration than that produced by the powder or pill form of vaccine. It is advised that "serum should be used upon animals with symptoms of blackleg. Serum and pellets should be used upon herds in which losses are occurring at the time of vaccination. Germ-free fluid vaccine should be used as an annual vaccination upon calves at weaning time or earlier, should conditions indicate necessity."

The eradication of tuberculosis from cattle and swine, J. A. Kiernan (*Amer. Jour. Vet. Med., 13 (1918), No. 1, pp. 1–7*).—A paper presented at the

thirty-fifth annual meeting of the Illinois Veterinary Medical Association at Chicago, in December, 1917, in which the author outlines some proposed plans for the eradication of tuberculosis from cattle and swine.

The struggle against bovine tuberculosis, A. GRANU (*Vie Agr. et Rurale, 8 (1918), No. 9, pp. 155–157, fig. 1*).—The author emphasizes the necessity of prophylaxis against bovine tuberculosis, and describes a French organizaton for its control having as its aims (1) to combat by the tuberculin test the propagation of bovine tuberculosis in the stables as far as possible, (2) to safeguard and defend the interests of the members in a contested case, and (3) to indemnify the members of the society in case of loss caused by the death or seizure of a tubercular animal.

Control of tuberculosis and infectious abortion, V. A. MOORE (*N. Y. Dept. Agr. Bul. 94 (1917), pp. 25–33*).—The history and nature of bovine tuberculosis are discussed and requirements necessary in a successful campaign for its suppression suggested. The author states that much more research will have to be done before definite successful methods of control of infectious abortion can be formulated, but that the provisional method of prophylactic treatment consisting of douches and disinfection should be carried out.

Paspalum notatum, the cause of a new disease of cattle, F. ROSENBUSCH and J. ZABALA (*An. Soc. Rural Argentina, 51 (1917), No. 3, pp. 245–248, pl. 1*).—This is a report upon a disease of cattle which occurs in the Provinces of Buenos Aires and Santa Fé, Argentina, and is characterized by generalized muscular trembling and debility. It is known as "tembleque" or "chucho."

Concerning "pasto dulce" and the disease which it causes in cattle, L. HAUMAN (*An. Soc. Rural Argentina, 51 (1917), No. 5, pp. 379, 380*).—The author takes exception to the identity of the plant reported as the cause of a new disease in cattle in the paper noted above.

"El gramillón" or "pasto dulce," the cause of "tembleque," F. ROSENBUSCH and J. ZABALA (*An. Soc. Rural Argentina, 51 (1917), No. 5, pp. 380–383*).—A further discussion of this subject.

Renguera, a paralytic sheep disease in Peru, S. H. GAIGER (*Jour. Compar. Path. and Ther., 30 (1917), No. 3, pp. 185–209, figs. 4*).—"Renguera is a new and hitherto undescribed disease of lambs, occurring in the Peruvian Andes. Sheep only appear to be susceptible. Renguera belongs to the class of nervous diseases to which louping-ill, scrapie, and swing-back in Britain, and pataleta in South America belong. Renguera is distinguishable from louping-ill by its affecting lambs only and by there being no convulsions in any form of the disease. From scrapie it is distinguished by there being no symptoms of skin irritation. Owing to insufficient knowledge of swing-back, it is not at present possible to compare that disease with renguera. Renguera agrees closely with some of the descriptions of pataleta in Argentina, but not with other descriptions. Renguera is almost constantly associated with a micrococcus, which can be grown from the fluids and tissues of the body, including sometimes the brain and spinal fluid, but in the absence of success in all attempts to transmit the disease, either with this coccus or with any of the fluids and tissues of the body, it is not possible yet to say if this coccus is the casual agent.

"Curative meaures hold out little promise of success. Preventive measures may be found in course of time from experiments in this direction which are now being carried out by those on the spot. The occurrence of this disease at an altitude where ticks do not exist should be of special interest to those concerned with sheep diseases in Britain, as it shows that ticks are unnecessary for the propagation of at least one sheep disease of the nervous type."

This report is based upon investigations made in Peru, following the author's arrival there in August, 1916.

Enzootic paraplegia in sheep, M. E. Tabusso (*Clin. Vet.* [*Milan*], *Rass. Pol. Sanit. e Ig.*, *40* (*1917*), *No. 16*, *pp. 457–472*, *fig. 1*; *abs. in Trop. Vet. Bul.*, *5* (*1917*), *No. 4*, *pp. 269–273*).—This is a report of studies of the disease of lambs occurring in the Peruvian Andes referred to as renguera by Gaiger in his report of investigations noted above, and also known as pataleta, tembladera, vertigo, and chucho.

Experimental studies in hog cholera, R. A. Craig and R. A. Whiting (*Indiana Sta. Bul. 204* (*1917*), *pp. 3–12*, *fig. 1*).—This is a report upon microscopical and cultural examinations made of blood and other virulent material from cholera hogs and inoculation and blood attenuation experiments.

The studies have shown that while *Bacillus suipestifer*, *B. suisepticus*, *B. coli*, and diplococci may be present in the blood and tissues of cholera hogs those present may not be the same in different outbreaks of the disease. *B. suipestifer* is usually met with and *B. coli* is not uncommonly present in highly virulent strains of blood.

In order to prevent blood used for virus from losing its virulence and avoid losses from septicemia in the hyperimmunes, it has been found necessary to inoculate pigs a few weeks old with filtered hog cholera blood and use their blood for inoculating the hogs used for producing virus. Since there is danger of stock virus losing its virulence if every generation is filtered, the authors' practice is to filter every second generation of blood used for inoculating young pigs.

In filtration and blood examination work more than 500 bacteria-free filtrates, mostly blood and virulent salt solution from cholera hogs, were studied, five different filters being used. It was found by inoculation tests that the filtrable virus did not uniformly pass through Pasteur-Chamberland filter B. It was noted that where filtration took place very slowly, extending over a period of several hours, and a vacuum maintained, the bacteria would pass through the different filters used.

An experiment undertaken for the purpose of determining the character of the hog cholera lesions produced by the filtrable virus is briefly reported upon. Hog cholera blood and blood filtrate inoculation experiments in which pigs from nonimmune mothers and weighing from 40 to 60 lbs. were inoculated with hog cholera blood and blood filtrates from virus hogs from 4 to 8 days following inoculation are reported upon in tabular form. The controls showed infection in from 4 to 10 days after one or more of the inoculated pigs developed a temperature of 104° F. The pigs inoculated with the 7- and 8-day virus did not live so long as those receiving 4-, 5-, and 6-day virus. It appears that 8-day virus is no more virulent than 4-day and less virulent than 6-day virus.

In determining the effect of heat hog cholera blood was heated in a water bath for different periods, ranging from 30 minutes to 2 hours, and at different temperatures. One lot of virus heated to 57° C. and three lots heated to from 51 to 55° for 2 hours produced the acute form of hog cholera in pigs that were inoculated with them. Virulent salt solution heated to from 55 to 60° in a water bath for 1 hour produced hog cholera in pigs inoculated with it.

Hog cholera blood to which normal salt solution had been added in the proportion of 1: 2 was incubated for from 21 to 72 hours at 36.5° and afterward heated 1 hour in a water bath at 60°, after which a 0.5 per cent phenol solution was added. Several lots of pigs were inoculated with 2 cc. each, and with some repeated in 5 days, but none reacted and all contracted hog cholera when exposed 2 to 3 weeks later.

Different proportions of hog cholera blood and antihog cholera serum were mixed and kept in a refrigerator for one day, then heated to 60° in a water bath for 1 hour, and 0.5 per cent phenol added. Tests upon pigs showed the

virus to have been destroyed and all contracted hog cholera on exposure. Experiments indicate that hog cholera blood to which 0.75 per cent carbolic acid has been added for 19 days or longer loses its virulence, as was shown by a longer incubation period, the percentage of recoveries, and the slowing up of the symptoms of the disease.

Experiments with desiccated hog cholera blood demonstrate that the virus can not be attenuated by the methods practiced, and that desiccated blood exposed to daylight and room temperature is usually destroyed within a short time.

Work with sensitized virus indicates that it is possible to immunize hogs against the disease in this way. Inoculation experiments with filtrates made from rabbits show that the filtrable virus maintains its virulence for this animal for a period of 7 days, but when passed through two rabbits it does not produce a typical hog cholera temperature reaction.

Notes on parasitic anaphylaxis and allergy, L. VAN ES and A. F. SCHALK (*North Dakota Sta. Bul. 125 (1917), pp. 151–193, pls. 2, fig. 1*).—The conclusion of the Seyderhelms (E. S. R., 35, p. 80) that infectious anemia of the horse is caused by a toxic substance obtained from Gastrophilus larvæ led the authors to conduct the investigations here reported in detail. In addition to experiments with Gastrophilus larvæ, which take up the greater part of the work, experiments were also carried on with *Ascaris megalocephala*, *Trichodectes parumpilosus*, *Toxascaris limbata*, *Belascaris marginata*, *Dipylidium caninum*, *Tænia serrata*, *Gyropus ovalis*, and *G. porcelli*.

The results obtained have led to the following conclusions: "There is no reason to believe that *Gastrophilus* spp. play a specific part in the causation of infectious anemia or swamp fever of the horse. The severe intoxication following the injection of Gastrophilus material into horses is not due to a special substance in the sense of the 'oestrin' of the Seyderhelms. Such intoxications are purely a manifestation of anaphylaxis and in no way differ from those precipitated by the use of any foreign protein. Many parasitic species sensitize their hosts. who upon reinjection will respond by anaphylactic or allergic reactions. The acutely toxic properties thus far found to be associated with parasites owe their toxicity to the specific sensitization of the animals injected with materials of parasitic origin. It is reasonable to assume that anaphylactically intoxicating substances of parasitic origin can gain entrance into the body through the same channels which previously served for the entrance of the sensitizing ones. By a more or less constant presence of certain parasites the body may be constantly supplied by parasitic anaphylatoxins. It is within the range of possibility that such a form of intoxication may give rise to certain more or less definite disease processes."

On the treatment of lymphangitis in the horse, CHAUSSÉE (*Rev. Gén. Méd. Vét., 27 (1918), No. 313, pp. 12–14*).—The author describes a method of cauterization in the treatment of lymphangitis and emphasizes the importance of applying this treatment at the first indication of the disease.

Bacillary white diarrhea, A. G. LUNN (*Jour. Mass. Poultry Soc., 1 (1917), No. 2, pp. 13–15*).—This is a summary of information.

RURAL ENGINEERING.

Second report of the State engineer of New Mexico, J. A. FRENCH (*Rpt. State Engin. N. Mex., 2 (1914–1916), pp. 103, pls. 30*).—This report deals with the work and expenditures of the office of the State engineer of New Mexico, especially on roads and bridges, irrigation, and river protection for the period

from December 1, 1914, to November 30, 1916, and continuing previous work (E. S. R., 36, p. 284).

Land drainage: Some notes on open draining and points in pipe draining, L. J. B. GRANT and A. J. FAULKNER (*Jour. Agr.* [*New Zeal.*], *15* (*1917*), *No. 2, pp. 91–95, figs. 5*).—Brief notes on open surface drains and on subsurface pipe drains for New Zealand conditions are given.

Tile drainage for the farm, H. B. WALKER (*Bien. Rpt. Kans. Bd. Agr., 20* (*1915–16*), *pp. 152–169, figs. 12*).—This is a brief discussion of tile drainage with special reference to Kansas farms.

The subsidence of muck and peat soils in southern Louisiana and Florida, C. W. OKEY (*Proc. Amer. Soc. Civ. Engin., 43* (*1917*), *No. 7, pp. 1499–1522, pl. 1, figs. 18*).—The object of this paper is to call attention to the fact that in designing drainage improvements it is often necessary to anticipate the subsidence of muck and peat lands subsequent to drainage. The results of some observations made in England on the subsidence of drained muck and peat lands are reviewed, and the results of first-hand observations made in Louisiana and Florida are reported in detail graphically.

"It is clearly evident that in planning drainage improvements for areas of deep muck land, some provision should be made for the gradual but certain decrease in elevation of the surface. In relatively small districts, where drainage is secured by pumps, this decrease can be met easily by lengthening the suction pipes on the pumps. As the drainage channels in such soft soils require considerable maintenance in the earlier years of drainage, they can be deepened accordingly. Where the land is drained by gravity, the elevation of the water at the outlet is usually fixed, and a change in elevation of the land to be drained will mean a revision of the hydraulic gradient in the main drainage channels, with the consequent change in width and depth of the channels."

Leveling of old battle fields, M. RINGELMANN (*Jour. Agr. Prat., n. ser., 30* (*1917*), *No. 10, pp. 178–180, figs. 2*).—Methods and machinery for leveling battle fields in France and preparing them for cultivation are described.

Surface water supply of New Mexico, 1916, J. A. FRENCH (*Santa Fe, N. Mex.: State Engin. Dept., 1916, pp. 146*).—This report presents the results of measurements of flow made on the Canadian, Gila, Mimbres, Pecos, Rio Grande, Rio Tularosa, San Francisco, and San Juan River Basins and in Estancia Valley, N. Mex., for 1916, continuing previous work (E. S. R., 37, p. 384).

[Ground water studies in the Rio Grande and Socorro Valleys] (*New Mexico Sta. Rpt. 1917, pp. 31–43, figs. 4*).—Preliminary observations are reported, together with maps and curves showing the behavior of the water table.

Surface waters of Vermont, C. H. PIERCE (*U. S. Geol. Survey, Water-Supply Paper 424* (*1917*), *pp. 218, pls. 10, figs. 2, maps 4*).—This report, prepared in cooperation with the State of Vermont, describes the general features and gives the results of flow measurements made on streams in the St. Lawrence and Connecticut River Basins of Vermont. A gazetteer of the streams of the State is appended.

Analyses of mineral and potable waters, A. M. PETER, S. D. AVERITT, and J. S. MCHARGUE (*Kentucky Sta. Rpt. 1915, pt. 1, pp. 49–72*).—Analyses of 57 samples of potable and mineral waters from 29 counties in Kentucky are reported.

Mineral springs of Alaska, G. A. WARING (*U. S. Geol. Survey, Water-Supply Paper 418* (*1917*), *pp. 114, pls. 6, figs. 16, maps 3*).—This report deals with the mineral springs of Alaska, with particular reference to their hygienic value.

A chapter on the chemical character of some surface waters of Alaska, by R. B. Dole and A. A. Chambers, is included.

"The few analyses available show a favorable condition of the surface waters. They indicate that the streams in general yield supplies moderate in mineral content, low in chlorid and sulphate, and essentially calcium carbonate in character. All the supplies tested are low enough in mineral matter to be useful for domestic and industrial use, and they resemble in composition the least mineralized waters of the United States."

Well waters from farm homesteads, F. T. SHUTT (*Canada Expt. Farms Rpts. 1916, pp. 180–185*).—Analyses of 173 samples of Canada farm water supplies reported show that 22 per cent were pure and wholesome, 24 suspicious and probably dangerous, 32 seriously polluted, and 22 per cent too saline to be potable.

Removing the taste due to algæ in drinking water, A. C. HOUSTON (*Brit. Med. Jour., 2919 (1916), pp. 816, 817; Pharm. Jour. [London], 4. ser., 98 (1917), p. 139; abs. in Jour. Soc. Chem. Indus., 36 (1917), No. 4, p. 232*).—"Potassium permanganate, added in quantities of 2.5 to 5 lbs. per million gallons, proved much more effective than hypochlorites in removing the nauseous taint due to the growth of algæ in reservoirs. . . . The use of hypochlorites involves the risk of merely replacing one taste by another or even of introducing a superadded taste."

The activated sludge process of sewage treatment: A bibliography of the subject, J. E. PORTER (*Rochester, N. Y.: General Filtration Co., Inc., 1917, pp. 40*).—This is a bibliography of the subject with brief abstracts, patents, news items, etc., compiled from current literature.

A preliminary report on blended Portland cement, E. S. MCCANDLISS (*Bul. School Mines and Metallurg., Univ. Missouri, tech. ser., 3 (1917), No. 3, pp. 53+13, figs. 22*).—Experiments are reported from which the conclusions are drawn that "Portland cements of a fineness sufficient to pass a No. 200 sieve may be blended as much as 40 per cent, by weight, with quartz sand, the latter of a fineness sufficient to pass a No. 65 sieve, but not fine enough to permit of more than 20 per cent to pass a No. 200 sieve, and the resulting blended cement will satisfactorily pass the requirements of the present standard specifications for Portland cement of the American Society for Testing Materials. Quartz sand is a satisfactory substitute for the inert clinker particles in Portland cement in maintaining the present physical characteristics of the latter, when used in amounts not to exceed 30 per cent, by weight."

The effect of sulphid on cement, J. C. WITT (*Philippine Jour. Sci., Sect. A, 11 (1916), No. 6, pp. 273–290, pl. 1, fig. 1*).—Experiments on the influence of a sulphid solution on the properties of cement are reported.

It was found that the time of setting is greatly modified by the presence of sodium sulphid, being retarded by the low concentrations, but after reaching a maximum further additions accelerate the set. In general, the cements highest in iron were the most sensitive to this influence.

"There is a decided decrease in tensile strength. The percentage loss varies with the concentration of the sulphid and with the iron content of the cement. The briquettes appear normal in every other respect, except in color. There is no cracking nor distortion of any sort. In most cases sulphid may be present in concentrations up to 1 gm. per liter without causing the tensile strength to fall below United States Government specifications. Certain results indicate that a colloid is formed by the action of sodium sulphid on the iron in the cement. Based on the results of both chemical and physical observations, the following explanations of the decrease in tensile strength are offered: (1) The precipitated colloid forms films of inert material through the cement and inter-

feres with the cohesion. (2) When the colloid is precipitated a portion of the dissolved calcium hydroxid is removed from solution. Since the latter substance is a very important factor in the strength of cement, it is to be anticipated that the strength will be lowered when some of it is removed.

"It is probable that a number of other factors influence the effect of sulphid on cement. Among these may be mentioned the fineness of the cement, the temperature at which it is mixed, the percentage of water used, and the amount of dissolved calcium hydroxid."

Asphalt, related bitumens, and bituminous rock in 1916, J. D. NORTHROP (*U. S. Geol. Survey, Min. Resources U. S., 1916, pt. 2, pp. II+263-281*).—This report discusses the occurrence, distribution, and production of asphalt and related bitumens, and states that "the quantity of natural asphalt, including bituminous rock, grahamite, gilsonite, wurtzilite, and the native paraffin, ozokerite, produced and sold at mines and quarries in the United States in 1916 was 98,477 short tons. This quantity was greater by 22,726 tons, or 30 per cent, than the output in 1915." Data on imports and exports are also included.

Investigations of gravel for road surfacing, T. R. AGG (*Iowa Engin. Expt. Sta. Bul. 45 (1916), pp. 32, figs. 23*).—Investigations are reported, the purpose of which was to determine in a general way the character of the road building gravels in the State of Iowa, to establish construction and maintenance methods adapted to Iowa conditions, and to determine the possibilities of the use of bituminous materials for the construction and maintenance of gravel roads. Analyses of 151 Iowa gravels show that they do not contain as great a percentage of pebbles as is desirable in road surfacing material and not sufficient clay to serve as a permanent binder, "yet the gravels do bind in time, showing that some other element in the gravel is a factor in the bonding action."

Experiments on methods of construction are also described, in which several sections of road with gravel surfaces were constructed by the two-course trench method, the single-course trench method, and as a single-course surface placed on top of the earth road. A road was also constructed of river gravel.

Experiments on the use of bituminous coatings on concrete surfaces are also described. In one case it has been found possible to maintain concrete roads in good condition by this method at a cost of not to exceed 2 cts. per square yard per year. Further experiments showed "that only a very few materials can be used for carpet coats on concrete and that they must be applied with extreme care or they will peel off the surface."

Experiments along this line in other States are reviewed and the conclusion drawn that "the service value of a well-built gravel road is so much greater than of the poorly built roads that it far outweighs the relatively small difference in cost. It is especially clear that it does not pay to skimp the materials and it is an extravagance to construct a good road and then fail to keep it in good repair. Gravel roads deteriorate very rapidly if neglected."

Labor-saving machinery, C. I. GUNNESS (*Mass. Agr. Col. Ext. Serv. Circ. 42 (1917), pp. 4, figs. 6*).—The purpose of this circular is to call attention to the machines which can be used to advantage in the raising of potatoes, corn, beans, and other garden crops, and when possible to indicate the size of plats which can be most profitably used.

Buying a farm tractor, W. H. SANDERS (*Bien. Rpt. Kans. Bd. Agr., 20 (1915-16), pp. 123-145, figs. 18*).—This is a review of the main factors influencing the selection and purchase of a tractor for a Kansas farm, including relative economy, first cost, depreciation, repairs, tractor types and speed, motor styles, fuel, lubrication, and size and power ratings. The use of the tractor on special kinds of work is also briefly discussed.

Tractors and their use in Mexico, E. Chávez (*Rev. Agr.* [*Mex.*], *1* (*1917*), *No. 1, pp. 17–20, pls. 5*).—A brief note on the use to which tractors may be put in Mexican agriculture.

Farm storage of grain, C. P. Buck (*Bien. Rpt. Kans. Bd. Agr., 20* (*1915–16*), *pp. 145–151, figs. 4*).—This is a brief discussion of portable and stationary grain storages and grain elevators for use on Kansas farms.

Farm manure and its housing, B. G. Southwick and F. W. Duffee (*Conn. Agr. Col. Ext. Serv. Bul. 5* (*1917*), *pp. 22, figs. 7*).—The purpose of this bulletin is to draw attention to the value of farm manures and to emphasize the economic importance of their proper care and housing. Plans for manure pits and other equipment for manure conservation are included.

Lambing sheds, R. F. Miller and G. E. Fermery (*California Sta. Circ. 188* (*1917*), *pp. 16, figs. 13*).—Illustrated descriptions are given for a lambing barn, an open-front lambing shed, movable lambing pens, and sheltered lambing pens and corrals.

RURAL ECONOMICS.

Important factors for successful farming in the blue grass region of Kentucky, J. H. Arnold and W. D. Nicholls (*Kentucky Sta. Bul., 210* (*1917*), *pp. 171–206, figs. 7*).—This bulletin contains additional data with reference to farms located in Mason, Scott, and Madison Counties, Ky., as previously noted (E. S. R., 36, p. 789).

The authors point out that the type of farming that should be followed in this community depends upon "the amount of land available, the topography, the quality of the land, and accessibility to market. The most general type suited to conditions in the blue-grass region is the stock with tobacco type. This type combines stock grazing, an enterprise characteristic of the most extensive type of farming, and tobacco culture, one of the most intensive enterprises, in such a way as to make the most profitable use of the land. It should be remembered in this connection that the farmer who keeps a large percentage of his acreage in blue grass for grazing of live stock will have better lands for tobacco raising, and that lands which have the best blue grass sods raise the best quality of tobacco. Blue grass is specially adapted to the soil and furnishes a nutritious food for fattening cattle, and at the same time it prevents erosion of the soil and keeps up its fertility; while an intensive crop like tobacco enables the farmer to get large returns per acre. Such a system enables the farmer here to make about as much off of a given area of high-priced land as is secured in other good agricultural sections where land is cheaper. A small farm can often be made profitable by intensifying more than is usually done, with tobacco or by dairying."

The authors illustrate their conclusions by citing data obtained from a number of representative farms from each type.

Farm management investigations in Missouri, R. M. Green and O. R. Johnson (*Missouri Sta. Bul. 151* (*1917*), *pp. 44, 45*).—These pages report preliminary results with reference to the average cost of keeping horses on farms during the year 1912–1915, inclusive.

The average cost was $90.33 per annum. The horses appreciated in value through the sixth year, and the average cost of feeding made up 72 per cent of the total cost of keep. On the 20 farms with the lowest feeding cost per head 30 per cent fed oats with corn in equal or larger proportion, while on the 18 farms with the highest feed cost per head 61 per cent used the large proportions of oats. For the economical management of horse labor the study indicated that the horse should work 800 to 1,500 hours a year. The average cost per hour of horse labor for 1912, 1913, and 1915 was 7.6, 8.2, 7.2, and

7.6 cts., respectively. The difference between the lowest and highest average feed cost per hour of horse labor was 4 cts.

Agriculture of the Hidatsa Indians.—An Indian interpretation, G. L. Wilson (*Univ. Minn., Studies Soc. Sci., No. 9 (1917), pp. X+129, pls. 5, figs. 40*).—This study is based on the narrative of an Indian woman, and contains information regarding the methods of laying out the garden, crops grown, methods of selecting seed, cultivating crops, tools used, storage for winter use, and the influence of the white man upon their system of agriculture.

[Social and educational surveys of Lancaster community, Kentucky], C. D. Bohannan (*Kentucky Sta. Rpt., 28 (1915), pt. 1, pp. 10–12*).—This survey has as its purpose the extension of the relations existing between town and country, and to formulate a plan for community development based on actual needs of the community. It points out that for sincere development there must be hearty cooperation. While country schools are on a par with those of any other community, there is too large a dropping out of pupils between the first and eighth grades. There is need for improvement in the housing conditions among the poorer classes, both owner and tenant. In place of a cultivated crop on hillsides subject to erosion alfalfa is suggested. It recommends the admission of farmers as well as city men to membership in the Lancaster Commercial Clubs and the installation in the high school of a department of agriculture and home science, with a short course during the winter months for older boys and girls.

The farmhouse in relation to food supply and labor problems, Mrs. Blair (*Jour. Bath and West and South. Counties Soc., 5. ser., 11 (1916–17), pp. 254–262*).—The author points out that it is the function of the farm home to be attractive and efficient, in order to maintain the necessary number of persons in the rural community.

The national food supply in peace and war, T. B. Wood (*Cambridge, England: Univ. Press, 1917, pp. 43*).—The author believes that in order to secure the necessary food supply for Great Britain "the policy which should be adopted must be based on five general principles: (1) It must secure the maximum amount of food for human consumption. (2) It must be sufficiently simple to be put into actual practice. (3) It must avoid dislocation of the ordinary channels of distribution. (4) It must remove temptation from the farmer, by making agricultural products which can be dispensed with less remunerative than those which are indispensable. (5) It must be enforced by penalties so heavy that no one dare risk them."

He also believes that these plans could be given effect, first by the publication of an order forbidding the use of potatoes and cereals for feeding live stock or for any other purpose than for human food; second, that in order that distribution may be continued through ordinary channels, there must be a certain elasticity in price which will allow distributing agents to make sufficient profit to maintain their normal efficiency.

Appeal for mobilization of agricultural products, G. Brunnelli (*Agr. Mod. Milan, 23 (1917), No. 18, pp. 237, 238*).—The author recommends the establishment of an Italian national committee with subsidiary local committees to supervise propaganda, provide fertilizers, aid in the requisition of agricultural products for military purposes, and obtain the services of scientific institutions in giving necessary advice regarding regional products and the national program.

Wheat dockage on a percentage basis, E. D. Davis (*Minneapolis, Minn.: Author, 1917, pp. 48*).—This pamphlet contains tables designed to facilitate the figuring of dockage and net weights on wheat when the dockage is computed on a percentage basis.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt., 4 (1918), No. 1, pp. 8*).—This number contains the usual monthly data with reference to the estimated value of important farm products, average prices received by producers, and range of prices of agricultural products at important markets, and also contains special articles on the largest 1916 crop yield, stocks of potatoes on January 1, firewood used on farms, and other miscellaneous data.

Annual statistics of Chile (*An. Estad. Chile, 7 (1915–16), pp. [8]+113*).—These pages continue data previously noted (E. S. R., 37, p. 92), by adding a later year.

Statistics of trade and agricultural products in Spain, 1916, M. MATESANZ (*Mem. Estad. Renta Aduanas, 1916, pp. 115*).—This report gives data with reference to the production and internal and foreign trade in agricultural products for 1916, with comparative data for earlier years.

[Agricultural statistics in Switzerland] (*Statis. Jahrb. Schweiz, 25 (1916), pp. 288*).—These pages continue information previously noted (E. S. R., 36, p. 393), by adding information for a later year.

Agricultural statistics of British India (*Statis. Abs. Brit. India, 50 (1905–1915), pp. VIII+260*).—These pages supplement information previously noted (E. S. R., 36, p. 291).

AGRICULTURAL EDUCATION.

Plan for the organization and administration of the Smith-Hughes Act (*Salem, Oreg.: Supt. Pub. Instr. [1917], pp. 14*).—This is a detailed statement of the plan for the organization and administration of vocational education in Oregon under the Smith-Hughes Act, submitted by the Oregon State Board for Vocational Education to the Federal Board for Vocational Education and adopted December 18, 1917, together with local plans for administering the same.

It has been arranged that the Oregon State Agricultural College will make a formal transfer to the State Board for Vocational Education of the time and services of its professor of agricultural education.

The plant and equipment of schools receiving Federal aid for vocational instruction in agriculture is to consist of a minimum of approved general equipment valued at $500 for an all-day or department school, an approved reference library, ground sufficient for experimental and demonstration purposes, and an annual fund of not less than $100 for incidental expenses. The minimum salary of teachers of vocational agriculture shall be $1,200, in addition to an annual maintenance fund.

In an all-day school or department at least 50 per cent of the time is to be spent on vocational agriculture, including project work, the study of material bearing directly on the project, and the study of related material. There must be at least six months' supervised farm-project work, carried on upon a commercial basis.

The minimum qualifications of a teacher of vocational agriculture shall be (1) graduation from a 4-year standard agricultural college course with the major work in general agriculture, and not less than 15 semester hours of agricultural education comprising practice teaching, special methods in teaching, educational psychology, principles of education, and a study of vocations and the relation of agriculture to economic conditions; and (2) not less than 2 years of practical farm experience. He shall be employed for the calendar year with provisions for vacations, etc.

The training of teachers of agriculture will be done by the Oregon College under the supervision of the State Board for Vocational Education. The course

of study will include 50 per cent of technical agricultural studies, 15 per cent of agricultural education subjects, including practice teaching, 20 per cent of related and allied subjects, and 15 per cent in approved electives to make a well-balanced course. Not less than two years of practical farm experience is required.

All-day home economics classes or departments must be in session for at least 9 months in the year and not less than 30 hours in the week. The course will be so arranged that at least one-half of the time of instruction will be devoted to such phases as garment making, foods and cookery, sanitation and home nursing, house planning and furnishing, textiles, millinery, dressmaking, and home management. The minimum qualifications for teachers will be (1) graduation from a 4-year course in home economics, with not less than 15 semester hours in educational subjects, including special methods, practice teaching, etc.; and (2) not less than 2 years of practical teaching experience and sufficient practical experience in housekeeping to make the instruction practical.

A teacher of vocational home economics in part-time schools must be a graduate from a standard college or university with a degree in home economics, conforming to the State school law of Oregon on the certification of teachers, and have had sufficient practical experience in the trade to make her instruction practical. In the evening classes the teacher must be a graduate from a standard college or university, or hold a life State certificate or State diploma secured by examination before the State department. The minimum salary of the teacher of vocational home economics is $1,000.

The training of teachers of home economics under this act will be done in the Oregon College under the supervision of the State Board for Vocational Education. By an arrangement for itinerant teaching, teacher-training will be carried on in the regular classes in the college and in evening schools in Portland. The course of study corresponds to that for teachers of agriculture, but requires practice work in different departments of a practice house maintained on a practical housekeeping basis.

Vocational education (*Oregon Bd. Vocational Ed. Bul. 1 (1917), pp. 15–28*).—This bulletin, which is combined with the plan for the organization and administration of the Smith-Hughes Act noted above, contains the general regulations of the State Board for Vocational Education.

A standard course in vocational agriculture for all-day or department students is to consist of 4 full years' or 16 units' credit, 15 units being required for graduation. A unit covers 2 hours a day for 36 weeks, or 360 hours a year. For practical work not requiring preparation, two hours' work is required for one hour's credit. No projects will be accepted as worthy of school credit which do not involve new experience and the acquiring of new skill for the student, i. e., projects to be acceptable must have educational value.

For instruction in home economics the State or local community, or both must provide an approved general equipment of not less than $500 value, an approved reference library, a practice house of not less than 5 rooms with approved furnishings, and an annual fund of not less than $50 for incidental expenses. Twenty pupils will constitute the maximum class or group of pupils to be instructed in home economic subjects by one teacher. A local advisory board is provided.

Report of the committee on teaching (*Amer. Farm Management Assoc. Rpt., 7 (1916), pp. 108–116*).—This is a report previously noted (E. S. R., 36, p. 297) on the status of advanced undergraduate teaching in farm management offered in 17 of the agricultural colleges.

The fundamental relation of botany to scientific agriculture, H. D. WAGGONER (*School Sci. and Math., 18 (1918), No. 1, pp. 11–15*).—This is a consideration of the fundamental relations of the scientific study of the plant to agricultural practices, in which the author urges that the thorough study of the fundamental structures and processes of plant life and the practical application of these scientific principles should form closely correlated courses for elementary students in agriculture. In his opinion this can be done without difficulty if the teacher of botany has sympathy for and knowledge of present-day agriculture and if the teacher of agriculture is familiar with the fundamental structures and processes of the plant.

Teaching of agriculture in the rural schools, F. C. HATHAWAY (*State Normal and Indus. School [Ellendale, N. Dak.], Bul., 12 (1917), No. 1, pp. 55, figs. 17*).—This is a series of 39 exercises planned to follow the order of the seasons and outlining the object, materials for, and method of studies of the general structure of plants and their parts, weeds, wheat, potatoes, corn, soils, crop rotation and farm management, horses, breeds of dairy cattle, dairy sanitation, hogs, and poultry. Suggestions for gardening and for a fly campaign, and references to the literature, are included.

A manual of home economics for the rural school (*Bul. State Normal School, San Diego, Cal., 4 (1916), No. 3, pp. 40, figs. 3*).—This bulletin offers suggestions for teaching health and sanitation, sewing, foods and cookery, care of babies and young children, the keeping of household budgets, etc., in rural schools without equipment for home economics instruction and in which the teacher has no special training in the subject. Recipes, suggested equipment at minimum cost, illustrative reports from rural teachers of home economics on work done in their schools, and references to the literature are included.

Suggestions for organizing and supervising junior home project work, F. L. GRIFFIN (*Cornell Rural School Leaflet, 11 (1917), No. 2, pp. 325–372, figs. 22*).—This leaflet offers suggestions for the organization and supervision of junior home projects in elementary agriculture and home making in the State of New York, the plan of which has been previously noted (E. S. R., 36, p. 896). References to the literature are included.

MISCELLANEOUS.

Report of Kansas Station, 1916 (*Kansas Sta. Rpt. 1916, pp. 49*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1916, a report of the director summarizing the work and publications of the station, and one special article. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Twenty-eighth Annual Report of Kentucky Station, 1915, Part 1 (*Kentucky Sta. Rpt. 1915, pt. 1, pp. IX+79, pls. 4*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1915, a report of the director on the work and publications of the station during the year, departmental reports, reports of analyses of mineral waters, and meteorological data. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Thirtieth Annual Report of Maryland Station, 1917 (*Maryland Sta. Rpt. 1917, pp. XXVIII+347, figs. 49*).—This contains the organization list; a report by the director on the organization, work, and publications of the station; a financial statement for the fiscal year ended June 30, 1917; and reprints of Bulletins 197–208, previously noted.

How the station works, F. B. MUMFORD (*Missouri Sta. Bul. 151 (1917), pp. 68, figs. 12*).—This contains the organization list, a report of the director on

the work and publications of the station, and a financial statement for the Federal funds for the fiscal year ended June 30, 1917. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Twenty-eighth Annual Report of New Mexico Station, 1917 (*New Mexico Sta. Rpt. 1917, pp. 92, figs. 14*).—This contains the organization list, a report of the director on the work and publications of the station, including reports of heads of departments, and a financial statement for the Federal funds for the year ended June 30, 1917. The experimental features not previously reported are for the most part abstracted elsewhere in this issue.

Thirtieth Annual Report of South Carolina Station, 1917 (*South Carolina Sta. Rpt. 1917, pp. 32*).—This contains the organization list, a report of the director on the work of the station, a financial statement for the fiscal year ended June 30, 1917, and departmental reports, of which portions of that of the animal husbandman are abstracted elsewhere in this issue.

Report of the Canada Experimental Farms, 1916 (*Canada Expt. Farms Rpts. 1916, vols. 1, pp. VIII+598, pls. 39; 2, pp. 599–1093, pls. 14; 3, pp. 1094–1499, pls. 43, fig. 1*).—Volume 1 of this report contains the report of the director, including general notes, meteorological data, and synopses of the work of the various divisions, branch farms, stations, and substations, and reports of the divisions of chemistry, field husbandry, and animal husbandry. Volume 2 contains reports of the divisions of horticulture and cereals. Volume 3 contains reports of the divisions of botany, bees, forage plants, poultry, tobacco, illustration stations, and extension and publicity. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Monthly Bulletin of the Ohio Experiment Station (*Mo. Bul. Ohio Sta., 2 (1917), No. 12, pp. 383–419, figs. 4*).—This contains several articles abstracted elsewhere in this issue, together with one entitled Feeding Swine in Dry Lot, by W. L. Robison, and notes. An index for 1917 is appended.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta. Mo. Bul., 5 (1918), No. 10, pp. 141–156*).—This number contains brief articles on the following subjects: The Function of Grades and Standards in the Marketing of Farm Products, by A. Hobson; Varieties and Culture of Cane Fruits in Western Washington, by J. L. Stahl (see p. 643); Silage Crops for Western Washington, by E. B. Stookey (see p. 637); Very Early Hatches Pay Best, by Mr. and Mrs. G. R. Shoup (see p. 678); and Winter Work in the Orchard, by A. Frank.

NOTES.

Connecticut State Station.—Elijah Rogers, of Southington, and William H. Hall, of South Willington, have been appointed to the board of control, vice Frank H. Stadtmueller and H. W. Conn, deceased.

Delaware College.—R. V. Mitchell, professor of poultry husbandry, has been granted leave of absence to assist in poultry and egg handling studies in the U. S. Department of Agriculture.

Iowa College.—The college abattoir building has been completed. It is a spacious brick structure with a judging ring and seating accommodations for 1,000 persons. A killing pen, cooling rooms, cooking vat, and equipment for by-product utilization are also provided.

Kansas College and Station.—W. M. Jardine, dean of the division of agriculture and director of the station, has been appointed president, effective March 1. L. E. Call, head of the department of agronomy, has been appointed acting dean of the division of agriculture and acting director of the station. O. E. Reed, in charge of dairy husbandry work, has also been appointed State dairy commissioner, vice G. S. Hine resigned to accept a commercial position.

Kentucky University and Station.—Under a State reapportionment tax law, enacted by the recent legislature, the revenues of the university have been increased by $200,000 per annum. Plans are under way for a material increase in the teaching staff and the undertaking of extensive repairs. The construction of new buildings is to be postponed for the present, but plans are being formulated for campus grounds under a permanent plan.

Dr. F. L. McVey was installed as president, June 4.

In the station, Dr. Philip L. Blumenthal, of the department of chemistry, and Owen S. Lee, of the department of fertilizer control, have been granted leave of absence for military service.

Maryland College.—The new agricultural building, costing $175,000, was dedicated at Commencement May 30. F. A. Wirt, of the Kansas College and Engineering Station, has been appointed extension lecturer in farm mechanics.

Minnesota University.—A recent State law authorized the maintenance of experimental peat farms at Dibbell, Goodridge, and Anoka. A tract has been secured for the farm at Goodridge. Arthur G. Tyler has been appointed assistant professor of farm engineering, vice L. R. Whitson resigned.

Missouri University.—L. F. Childers, extension specialist in soils, has been appointed emergency demonstration agent with headquarters at Fayette, beginning April 1. R. A. Kinnaird, extension instructor in soils, has been appointed agricultural agent for Clinton County. Miss Bab Bell, extension assistant professor of home economics, has resigned, effective March 9, and has been succeeded by Miss Essie Margaret Heyle. The resignations are also noted of John S. McDaniel, extension assistant professor of veterinary science, effective April 1, and Clifton R. Thomson and S. R. Miles as assistants in animal husbandry, effective April 6 and March 15, respectively.

Two-year certificates in agriculture have been awarded to a class of 20 students.

Cornell University and Station.—Dr. Lewis Knudson, professor of botany in the college of agriculture and plant physiologist in the station, has been granted

leave of absence to engage in Y. M. C. A. work in France. Lawrence Erickson has resigned as instructor in botany and has enlisted in the Coast Artillery.

Ohio State University.—The appointment is noted of L. O. Lantis, of the extension department, as instructor in rural economics.

Porto Rico Federal Station.—F. E. Kempton, Ph. D., University of Illinois, 1918, has been appointed pathologist.

Tennessee University.—Four tractor short courses of three days each were held during March and April at Knoxville, Jackson, Memphis, and Columbia. The courses were under the supervision of the division of extension and the college of engineering of the university, the Food Administration, and the State department of agriculture, and in the Memphis short course the extension divisions of Mississippi and Arkansas and the college of engineering of the University of Arkansas cooperated.

Virginia College and Station.—The legislature made substantial increases in its appropriations for the biennial period ending February 29, 1920. The college will receive $153,000 the first year and $128,000 the second year, and provision is made for the establishment of a department of education. The station will receive $30,000 each year, this being an annual increase of $14,000. The extension division will receive $76,191.57 the first year and $92,191 the second year. The Crop Pest Commission and the Live Stock Sanitary Board will receive $15,000 and $12,500, respectively, each year.

A. B. Massey, assistant professor of botany and assistant botanist of the Alabama College and Station, has been appointed associate plant pathologist and bacteriologist, effective June 1.

Canadian Instruction in Agriculture behind the Lines.—A system of instruction has been organized in one of the divisions of Canadian troops in France, and known as the University of Vimy Ridge. Lectures are given to large groups on subjects selected to equip men in active service for "greater efficiency in business, the professions, agriculture, and other great industries of the Dominion." Classes are organized for smaller groups, and individual instruction for more advanced students with recognition and credit on their return to Canada for work accomplished. It is also planned to obtain in this way an organization and staff which will be prepared to devote its attention to educating the soldiers during the interval which may elapse between the conclusion of peace and their return to Canada. Agriculture, applied science, and vocational branches are among the subjects to be taught in this way.

What is known as Khaki College has subsequently been organized. This work is carried on farther back of the lines than the foregoing and is constituted on a somewhat more elaborate and permanent basis. A chancellor and senate have been appointed to serve as the governing body, together with what is termed an executive faculty, consisting mainly of heads of departments. Certificates of proficiency are issued by the college on the recommendation of heads of departments.

Eight departments have been arranged, among which is agriculture. Lieutenant P. Stewart, formerly district supervisor of agriculture in New Ontario, has been given charge of the work in agriculture, which also has two lecturers on animal husbandry, and one each on field husbandry, horticulture, farm bookkeeping, agricultural English, and poultry.

Khaki College has been under way about six months. Over 900 students have been enrolled and about 370 took the first examination.

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A. C. TRUE, DIRECTOR

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AGRICULTURAL BOTANY.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

FOODS—HUMAN NUTRITION.

ANIMAL PRODUCTION.

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U. S. Department of Agriculture—Contd.

[1] Printed in scientific and technical publications outside the Department.

EXPERIMENT STATION RECORD.

Vol. 38. June, 1918. No. 8.

From time to time reference has been made in these columns to the progress and development of the International Institute of Agriculture at Rome. This unique institution, conceived to bring together the nations of the world for the advancement of agricultural interests through cooperative endeavor, has been from its inception a very interesting undertaking. Organized after many discouragements and delays, and regarded even after its establishment with some skepticism, it has entered upon a number of important fields of service and has demonstrated its capacity for usefulness in many directions.

The Institute has now completed its first decade of active operations. Much of this period has been necessarily devoted to problems of organization. The number of countries supporting it financially has been increased from forty to fifty-six, representing fully ninety-eight per cent of the entire population of the world. To enlist and retain the cooperation and support of these nations for so novel an enterprise has been in itself no small achievement. In addition a permanent organization has been effected, a staff of about one hundred regular employees has been built up, several series of publications established, and tangible progress made on numerous projects of importance.

It will be recalled by those familiar with the history of the Institute that responsibility for its establishment belongs primarily to two men. The idea originated with an American, Mr. David Lubin, of California, who has from the beginning remained the representative of the United States on the permanent committee. In carrying the project into effect, Mr. Lubin obtained the active support of King Victor Emmanuel of Italy, upon whose invitation an international conference was held in Rome in 1905. This conference formulated a treaty under which, upon the ratification of the various nations, the Institute was permanently located in Rome.

The king erected a palace in 1908 as the headquarters of the Institute, and provided an annual fund of about $60,000 toward its support. The greater part of its budget, however, is supplied by the adhering nations on a cooperative basis from subscriptions ranging

from $500 to $8,000 each per year. Additional appropriations are made by many nations for the translation of the publications from French, the official language of the Institute, into their respective tongues. Some revenue is also obtained from the investment of the accumulated reserve funds and the sale of publications. The total income is normally about $250,000 per annum. Of this amount the United States now contributes $16,600, of which $5,000 is toward the publication of English editions and the remainder for the payment of its subscription quota and the maintenance of a permanent representative.

The management of the Institute is intrusted to two bodies, a governing board known as the general assembly, and an executive board termed the permanent committee. The delegates to both these bodies are chosen by the respective governments, thus making the Institute distinctly an international enterprise. The general assembly was expected to meet about once in two years for sessions of about a week's duration to vote the budget, review and approve the work of the permanent committee, and authorize changes desired in the plan and methods of work, but on account of the war conditions no meeting has been held since 1913. The permanent committee, however, which comprises the permanent resident representatives of the various nations, has continued to meet about once a month and to administer the affairs of the Institute along substantially the usual lines.

The original aim in founding the Institute is well set forth in a letter of King Victor Emmanuel in 1905, advocating its establishment, as follows: "Farmers, who generally form the most numerous class in a country and have everywhere a great influence on the destinies of nations, can not, if they remain isolated, make sufficient provision for the improvement of the various crops and their distribution in proportion to the needs of consumers, nor protect their own interests on the market, which, as far as the more important produce of the soil is concerned, is tending to become more and more one market for the whole world. Therefore, considerable advantage might be derived from an international institute, which, with no political object, would undertake to study the conditions of agriculture in the various countries of the world, periodically publishing reports on the amount and character of the crops, so as to facilitate production, render commerce less expensive and more rapid, and establish more suitable prices. This institute, coming to an understanding with the various national offices already existing for the purpose, would also supply information on the conditions of agricultural labor in various localities, so as to serve as a safe and useful guide for emigrants; promote agreements for mutual defence against diseases of plants and animals, where individual action is insufficient,

and, finally, would exercise an action favorable to the development of rural cooperation, agricultural insurance, and credit." Most of the objects set forth in this letter were embodied in the treaty of 1905, which constitutes its basis of operations.

The work of the Institute is now organized under four bureaus. These consist of the General Secretary's Department and Library, and the Bureaus of General Statistics, Agricultural Intelligence and Plant Diseases, and Agricultural Economics. Mention should also be made of the four permanent commissions corresponding to the bureaus. These commissions serve as advisory bodies to the respective bureaus, while their presidents, together with the president and vice-president of the Institute, form a special committee to deal with many matters of administration. A number of special commissions have also been created from time to time. The permanent staff of employees consists mainly of abstractors, statisticians, and translators, and usually represents from ten to twelve nationalities.

The General Secretary's Office is largely administrative, but also includes the Library and the Bureau of Agricultural Legislation. The Library is, of course, an important feature of the Institute. It has now been organized eight years and consists of about 70,000 volumes dealing with agriculture, the natural and social sciences, etc., of the various countries. Nearly 2,700 periodicals are normally received, special efforts being made to secure those dealing with agricultural economics and statistics. It is thus already among the largest agricultural libraries in existence, and it is expected to build it up much more extensively at the close of the war.

The Bureau of Agricultural Legislation began work in 1911 and has since published annually an *International Yearbook of Agricultural Legislation.* This volume contains the texts of the most important enactments of the year and bibliographical references to many others of less significance. It constitutes a most useful compilation of material not otherwise assembled and most difficult of access. The preparation of a five-year index to this legislation was approved in 1916, but its execution has been postponed until the close of the war.

The Institute has been from the beginning particularly interested in the production of statistical information as to crop and market conditions. It has realized the great advantage to farmers and to others of complete and authoritative information as to the state of the world crops, the estimated and actual harvest, wholesale and retail prices and their fluctuations, trade movements, and similar factors. The obtaining of such information obviously presupposes the existence of adequate crop reporting machinery within the various nations, and the provision of such machinery is a national and not an

international problem. The Institute has, however, endeavored through its permanent committee and general assembly to bring about an improvement in this direction and considerable progress is reported. It is announced that the agricultural statistical service in several countries has been organized entirely or in part on the basis recommended by the Institute, and that in a number of others greater uniformity in methods of reporting data has been secured.

The statistical work of the Institute is centered in the Bureau of General Statistics. This bureau has published monthly since 1910 the *Bulletin of Agricultural and Commercial Statistics*, each number now averaging about forty pages and issued in French, English, German, Italian, and Spanish editions. It constitutes a monthly international compilation of data furnished by the respective countries as to the most important crops, and despite many difficulties and limitations, supplies much data not previously available in so complete a form. During the present year a supplementary series, known as *Documentary Leaflets*, has been added, these comprising data on miscellaneous agricultural projects of tropical countries. Two semi-annual reviews are prepared, one dealing with the statistics of cereals and the other with the international movement of fertilizers and chemicals useful to agriculture. Most of these data, together with other information, are subsequently assembled into the voluminous *International Annual of Agricultural Statistics*. Several monographs dealing with special phases of statistical work have also been issued. Among them may be mentioned *Les bases théoriques de la statistique agricole internationale*, published in 1914, which discusses in detail the principles to be followed in organizing agricultural statistical services.

As a recent statement by the Institute points out, " an international institute of agriculture can not be conceived which has no service designed to supply the nations with information of every sort regarding the increasing progress along technical lines in every branch of agriculture." This essential function is intrusted to the Bureau of Agricultural Intelligence and Plant Diseases. This Bureau publishes a monthly abstract journal in five languages, as well as monographs on current questions from time to time.

The abstract journal, which has special interest to readers of the *Record*, was established in 1910 under the name of the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, but has recently been rechristened the *International Review of the Science and Practice of Agriculture*. Originally it contained both abstracts and original articles, but of late it has restricted itself to the abstracting of current literature. It is stated that about 1,000 publications are regularly abstracted, and from 1,300 to 1,400 abstracts are published

each year. This number is of course much smaller than that for the *Record*, which in recent years has abstracted from 7,000 to 8,000 articles annually. The point of view is also somewhat different, one leading aim being to supply information directly to farmers. Many of the publications received by the Institute are not available in this country, particularly since the outbreak of the war, and most timely assistance has thus been rendered in making their contents available to scientific workers. The *Record* welcomes this opportunity to acknowledge its appreciation of this assistance.

Special arrangements have been made by the Institute with the Dominion of Canada, whereby in recent years many of the abstracts in the *Review* have been reprinted in the original or condensed form in the *Agricultural Gazette*, the official publication of the Canadian Department of Agriculture. The recently established official *Journal of the Board of Agriculture of Scotland* has also been aiding in the further dissemination of the information provided by the *Review*.

Three monographs have thus far been prepared by the Bureau of Agricultural Intelligence and Plant Diseases. These deal respectively with the organization of the services for the control of plant diseases and insect pests in the various countries, the production and consumption of chemical manures in the world, and the campaign against locusts in several regions.

The fourth division of the Institute is the Bureau of Economic and Social Intelligence. This bureau deals, as its name implies, with questions of rural economics and sociology, giving special prominence thus far to agricultural cooperation, credit, insurance, and legislative measures. Its publications correspond in a general way to those of the Bureau of Agricultural Intelligence and Plant Diseases. Its monthly periodical, however, the title of which was recently changed to the *International Review of Agricultural Economics*, consists chiefly of original articles on current economic questions. The monographs have dealt with the status of agricultural cooperation in the principal European countries, hail insurance and some of its problems, the organization of the statistics of agricultural cooperation in certain countries, and an outline of European cooperative credit systems. The last-named publication was reprinted in this country as a public document and received wide dissemination during the discussion of the Federal Farm Loan Act.

Each of the bureaus prepares short communications for the press. Brief abstracts are given of the contents of the various bulletins, crop summaries, and other important data. The Bureau of Economic and Social Intelligence issues monthly, in five languages, leaflets of from four to six pages summarizing its longer articles for use of the press. The various press leaflets are widely distributed, par-

ticularly to the agricultural press of the world, and have proved very successful in securing extensive dissemination of the findings of the Institute.

In addition to the service rendered by its publications, the Institute is empowered under the treaty of establishment to submit to the various governments "measures for the protection of the common interests of farmers and for the improvement of their conditions." This function has been attempted in several directions.

Reference has already been made to efforts to standardize crop statistical reports. As one step along this line the Institute has advocated the general employment of the metric system. The introduction of dry farming practices employed in this country has been suggested to various other nations, and it is stated that the suggestion has met with favorable response in Hungary, Russia, Italy, Spain, Greece, Algeria, and Tunis.

The international protection of birds useful to agriculture, hail insurance and other meteorological problems extending far beyond national boundaries, and the combating of the spread of locusts may be cited as other features of endeavor. The Institute suggested the holding of the International Congress of Phytopathology, which met in Rome in 1914, and has proposed to the International Meteorological Committee the formulation of a program of an international service of agricultural meteorology.

The operations of the Institute have been, of course, profoundly affected by the war. At the beginning of hostilities its very existence seemed dubious. As its vice-president, M. Louis-Dop, has pointed out in a recent report reviewing its history and progress, the question was immediately raised as to the possibilty of maintaining, in a conflict which has transformed the political and economic conditions of every continent, an organization based upon the collaboration of nations, the working together of a committee representing all the powers, belligerent or neutral, and the efforts of a personnel of international composition. Notwithstanding these obstacles, the continuation of the enterprise was decided upon. Apparently it was felt that the Institute had been established as a permanent institution and the suspension of its operations should be avoided if possible. More than this, it was expected that the usefulness of the Institute to the world would be in many ways intensified by the war conditions.

The work of the Institute has, therefore, been carried on so far as possible. No nation has abrogated the treaty, so that all are full members as before. Meetings of the permanent committees have been held regularly, and each of the bureaus has been performing

its functions much as in 1914, although crop reports and similar data have been withheld by the Central Powers.

The immediate result of the war upon the Institute has been on the whole to increase and stimulate its activities. The need for accurate statistical data regarding the world's food supply has never been so urgent. Information as to improved farm methods and economic measures has been eagerly sought for and with more prospect than ever before of its practical utilization. As regards technical material, particular efforts have been made to render available data as to means of diminishing the impoverishment of the soil, overcoming the shortage of fertilizers and labor, and increasing the use of farm machinery. A special function has been the answering of inquiries regarding agriculture in countries whose own agricultural and statistical departments have been disorganized by the war. It is announced that these various efforts of the Institute have met with unusual appreciation from the governing authorities of many nations.

The officers of the Institute are also looking forward quite optimistically to the future of the institution after the war. They believe that the return of peace will bring with it vast agricultural problems of international significance, and that during the reconstruction period the Institute will have a specially important function to perform. There will be a great demand for accurate information along statistical, economic, and technical lines, much of it international in its scope, and for the collection and dissemination of which a central clearing-house, such as this, will have unique possibilities. The Institute is already making plans for service in these directions, and more specifically in such projects as the control of locusts, the improvement of the economic status of the farmer, the establishment and development of small holdings, maritime transportation of farm products, the unification of methods for agricultural statistics, farm accounting, control of seed adulteration, and concentrated feeding stuffs, and the development of rural sociology.

Despite the unexpectedly difficult problems it has encountered, the Institute thus enters upon the second decade of its operations with its organization virtually intact, its publications and other lines of work going on with little interruption, and an ambitious program being formulated for the future.

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RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The physical chemistry of the proteins, T. B. Robertson (*New York and London: Longmans, Green & Co., 1918, pp. XV+483, figs. 7*).—This is a new edition in English of the book previously noted (E. S. R., 29, p. 408), and has been almost entirely rewritten and enlarged to include the literature on the subject through the middle of 1917.

In the introduction the author comments upon the development of two rather sharply differentiated schools of opinion in regard to proteins and colloids in general. "The one school endeavors, so far as technical difficulties permit, to apply directly, with modifications suggested by the properties and structure of the particular colloid under investigation, the known laws of what may be termed 'molecular' physical chemistry to protein and other colloidal systems, while the other school hesitates to do so." The author claims allegiance to the former school, and in this work endeavors to interpret the physico-chemical behavior of the proteins in the light of the laws of Boyle and Gay-Lussac as applied to solutions by van't Hoff and of the Guldberg and Waage mass-law. He has assumed the validity in protein systems of the first and second laws of heat, and in considering the electrochemical behavior of proteins the applicability of Arrhenius' hypothesis of electrolytic dissociation, of Kolrausch's law of the independent motion of ions, of the Nernst theory of concentration cells, and the applicability of the Guldberg and Waage mass-law to reactions between ions.

The book contains an extensive bibliography and an appendix in which the author's technique of electrochemical measurements in protein systems is explained.

A detailed method for the preparation of histidin, H. M. Jones (*Jour. Biol. Chem., 33 (1918), No. 3, pp. 429–431*).—The author describes in detail a method for the preparation of histidin from the so-called "blood paste," a concentrated suspension of red blood corpuscles obtained by centrifugating defibrinated ox blood. The method is a more detailed statement of the one already in use and emphasizes certain apparently insignificant steps in the process which are easily overlooked.

The distillation of cellulose and starch in vacuo, A. Pictet and J. Sarasin (*Compt. Rend. Acad. Sci. [Paris], 166 (1918), No. 1, pp. 38, 39*).—The distillation of cellulose under a pressure of 12 to 15 mm. results in the formation at a temperature of between 200 to 300° C. of a thick yellow oil which soon changes to a pasty semicrystalline mass. Purification by recrystallization from boiling acetone or water gives a white anhydrous crystalline substance very soluble in water, alcohol, acetone, and acetic acid, and almost insoluble in other organic solvents. The water solution is neutral to litmus and both sweet and bitter to the taste. It does not distill without decomposition at ordinary pressure. It reacts readily with acetyl and benzoyl chlorids, giving triacetyl and tribenzoyl derivatives.

The properties of the substance agree closely with those of levoglucosane, an hydrolysis product of certain glucosids. Starch and dextrin also yield the same product when distilled under reduced pressure, indicating that it is possibly the primary hydrolysis product of carbohydrates in general.

The enzyms which are concerned in the decomposition of glucose and mannitol by Bacillus coli communis, I–III, E. C. GREY (*Proc. Roy. Soc.* [*London*], *Ser. B, 87* (*1914*), *No. B 597, pp. 472–484, fig. 1; 90* (*1918*), *No. B 625, pp. 75–106, figs. 5*).—Part 1 of this paper deals with the action on glucose and mannitol in the presence of peptone of two artificially selected strains of *B. coli communis* obtained by growth of normal *B. coli communis* on agar containing sodium chloracetate.

It was found that the selected strains produced from glucose lactic acid in relatively greater, and alcohol, acetic and formic acids in relatively less, proportion than did the original strains, while from mannitol there was no diminution in the production of alcohol and acetic and formic acids. It is concluded that the artificially selected strains have not lost the enzyms which bring about the final reaction in the production of alcohol and acetic acid, but that a diminution of the reducing mechanism of the cell has resulted so that some intermediate substance from which formic acid and the precursor of alcohol and acetic acid are derived can not be readily decomposed.

Part 2 reports experiments of short duration with an emulsion of the organisms similar to those above with the exception of the omission of peptone. A greater proportion of alcohol, acetic acid, and succinic acid and a smaller proportion of lactic acid were obtained.

The results of the experiments show that (1) succinic acid has an origin in common with acetic acid and alcohol, (2) the formation of lactic acid is independent of the formation of the above products, and (3) the enzyms which effect the decomposition of glucose also cooperate in the decomposition of mannitol.

The author concludes that the fermentation of various carbohydrates and allied substances by bacteria is brought about by a single set of enzyms whose actions are common to all such cases of fermentation. It is possible that the first step in the degradation of a particular molecular structure may require a special enzym in order to produce the first intermediate substance which would be the same for all analogous cases of fermentation.

Part 3 deals with various phases in the decomposition of glucose by an emulsion of the organisms. The products resulting at different stages in the decomposition of glucose by *B. coli communis* were analyzed with the following results: During the period characterized by the rapid death of the cells there was no formation of lactic acid, the sugar being transformed into alcohol and formic, acetic, and succinic acids. During the period of multiplication there was a transformation of glucose into a more complex substance, and in the period immediately following lactic acid was produced to the extent of 70 per cent of the sugar consumed. The independent existence of enzyms in the cell has been shown by the fact that the amount of sugar decomposed during the rapid diminution in the number of cells was as great as during the growth of the cells and by the fact that the several fermentation phenomena are independent of one another.

Studies on enzym action.—XIV, Further experiments on lipolytic actions, K. G. FALK (*Jour. Biol. Chem., 31* (*1917*), *No. 1, pp. 97–123*).—Continuing the studies previously noted (E. S. R., 34, p. 111), a systematic investigation of the factors which control the loss or destruction of the activity of the ester-hydrolyzing enzyms or lipases was undertaken.

"The inactivation of esterase and lipase preparations by acids, bases, neutral salts, alcohols, acetone, esters, and heat led to the hypothesis that the active enzym grouping in these substances possessed the enol-lactim structure, —C(OH)=N—, which became inactive by tautomerization to the keto-lactam structure, —CO—NH—. This hypothesis was tested by studying the actions of such groupings in dipeptids and an imido ester."

It was shown that "in the presence of simple peptids, esters are hydrolyzed under conditions which favor the production in the former of the enol-lactim grouping, that ethyl imidobenzoate, having the enol-lactim structure, possesses marked ester-hydrolyzing action as well as certain properties strikingly analogous to those of the naturally occurring lipolytic enzyms, and finally that, under conditions under which the occurrence or formation of the enol-lactim structure might be expected (action of alkali), ester-hydrolyzing substances are produced from proteins."

The method of specific coagulation applied to the ferments of the pancreatic juice, E. S. London and E. P. Pakhotina (*Compt. Rend. Soc. Biol. [Paris], 80 (1917), No. 15, pp. 758, 759; abs. in Chem. Abs., 12 (1918), No. 1, p. 47*).—By fractionating a mixture of the ferments of pancreatic juice by successive treatments with ammonium sulphate ions according to the principle outlined on page 786, the authors were able to obtain a successive precipitation of the different ferments. The amylolytic ferment was precipitated first at a concentration of ammonium sulphate of 20 gm. per 100, the proteolytic next at 30 gm. per 100, and the lipolytic last at almost 50 gm. per 100.

Improvements in bacteriological media.—I, A new and efficient substitute for "nutrose," R. L. M. Wallis (*Indian Jour. Med. Research, 4 (1917), No. 4, pp. 786–796; Agr. Jour. India, 12 (1917), No. 4, pp. 621–632; abs. in Chem. Abs., 12 (1918), No. 5, p. 493*).—The new substitute for "nutrose" is composed of 94 parts peanut flour, 5 parts casein, and 1 part sodium carbonate. The product consists of a very finely divided white powder with a sweet taste and a neutral reaction. Its solution in hot water gives a faint opalescence due to the fat still remaining in the peanut flour. Used in the Conradi-Drigalski culture medium, it gives a transparent medium on which organisms of the typhoid-coli group grow very rapidly. The property of stimulating the growth of organisms is apparently due to the presence of a "vitamin" associated with the globulin of the peanut flour.

The author states that combined with egg white and a little salt the new nutrose makes an excellent diabetic bread of high protein and low carbohydrate content.

A method for the preparation of uniform collodion membranes for dialysis, C. J. Farmer (*Jour. Biol. Chem., 32 (1917), No. 3, pp. 447–453, fig. 1*).—An apparatus is described by means of which uniform collodion dialyzing membranes may be made. The permeability and time of dialysis may be established by standardization with phosphate mixtures and may be changed by varying the period of drying.

Oxidation of ammonia to oxids of nitrogen, W. G. Adam (*Chem. Trade Jour., 62 (1918), No. 1606, pp. 181, 182, fig. 1*).—A commercial converter is described capable of producing one ton of nitric acid every 24 hours from synthetic ammonia. The converter consists essentially of an aluminum box containing a window for observation and having four close layers of platinum gauze held by asbestos rings between aluminum flanges. The lighting up of the catalyst is obtained by means of an electrically heated platinum spiral inserted in the mixture of ammonia and air in close contact with the catalyst, a mixture richer in ammonia being passed for a few seconds until the catalyst is sufficiently hot to

continue the action. With the thickness secured by four layers of the gauze, and the correct flow by gas, the heat developed is sufficient to maintain the catalyst at the correct temperature after the action has started. Less than four layers allows a slip of ammonia through the catalyst.

The preparation of cyanamid, A. E. OSTERBERG and E. C. KENDALL (*Jour. Biol. Chem., 32 (1917), No. 3, pp. 297, 298*).—A method by which cyanamid may be easily obtained in a high state of purity is described as follows:

Two hundred gm. of calcium cyanamid are mixed in a 3-liter flask with 1,500 cc. of distilled water. Into this mixture carbon dioxid is passed until the reaction is neutral or only slightly alkaline. The temperature should be kept below 40° C. to prevent polymerization. The precipitate is then filtered on a Buchner funnel and washed with water. The filtrate is placed in a 3-liter flask, a small amount of talcum added, and the solution concentrated by distillation on a water bath in vacuo until a solid crystalline mass is formed on cooling under cold water. This is extracted three times with ether, the ether distilled off on a water bath, and the remaining solution concentrated over sulphuric acid in vacuo. The method gives a yield of 92 per cent of the theoretical.

Dried blood in agriculture; its importance and researches on its adulteration, M. SIROT and G. JORET (*Ann. Sci. Agron., 4. ser., 5 (1916), No. 10–12, pp. 473–495*).—The authors emphasize the importance of detecting adulteration in dried blood, describe the usual methods of preparing blood and roasted leather for fertilizers, and discuss the detection of adulteration in dried blood by the microscopic method, its general characteristics, tannin content, and proximate analysis.

The most common adulterant of dried blood is roasted leather meal, which, from the point of view of rapidity of assimilation of nitrogen, is of very little value compared with dried blood. Detection of this adulterant is difficult by microscopic examination on account of the presence in a poorly prepared blood of particles closely resembling those in leather meal. Pure samples of dried blood and of leather meal can be differentiated by their general appearance, odor, and behavior on heating, but in a mixture of the two the tannin test is the best indication of the presence of the leather meal.

Tables are given of the content of nitrogen, moisture, ash, total organic matter, and protein in pure dried blood, leather meal, dried meat, dried horn, and other fertilizers. The difference between the total organic matter and protein is a useful factor in detecting adulteration of dried blood, for the pure blood gives a value of from 0 to 3.5, while in adulterated bloods the values are considerably above 3.5. Composite fertilizers sold under the name of organic fertilizers and characterized by mixtures of mineral superphosphates and organic nitrogen in the form of blood, leather, or dried meat have been examined and the amount of leather determined by this factor.

In 112 samples of dried-blood fertilizers examined by the authors from September, 1913, to March, 1917, 46 were adulterated, those by leather alone exceeding 26 per cent. Attention is called to the importance of determining in a fertilizer not only the amount of nitrogen but its nature.

The ratio of total nitrogen to soluble nitrogen in flour, E. ROUSSEAUX and M. SIROT (*Ann. Falsif., 10 (1917), No. 109–110, pp. 556–560*).—Continuing investigations previously noted (E. S. R., 31, p. 809), the authors have determined the ratio of total to soluble nitrogen in several varieties of flour with particular reference to the baking quality of the flour. The following results were obtained: Flour with extraction value below 70 per cent, 5.73; extraction value above 70 per cent, 6.2 to 7.3; American flour rich in gluten, 7.8 to 8; suspected flour, 1.6 to 5; corn flour, 5.5; rye, 4.4; a mixture of 15 per cent rye and

85 per cent wheat, 5.57; bean flour, 8.2; rice flour, 23.6; 10 per cent rice and 90 per cent wheat, 7.75. Addition of limewater to an inferior flour gives a lower nitrogen ratio and improves the baking quality.

The authors conclude that a too great disproportion between total and soluble nitrogen corresponds to difficulties in baking, and that the action is most favorable when the nitrogen ratio is in the vicinity of 6. The determination is of practical interest in indicating the proportions of different flours necessary to produce the best results in baking.

The soluble nitrogenous matter as an index of the baking value of flour, ROUSSEAUX and SIROT (*Compt. Rend. Acad. Sci. [Paris], 166 (1918), No. 4, pp. 190–192; Ann. Chim. Analyt., 23 (1918), No. 3, pp. 50–55*).—Substantially noted above.

The catalase activity of American wheat flours, C. H. BAILEY (*Jour. Biol. Chem., 32 (1917), No. 3, pp. 539–545, fig. 1*).—The author at the Minnesota Experiment Station has investigated the relationship between the catalase activity and grade of American wheat flours with a view to the practicability of utilizing this test in distinguishing between different grades of flour. Four series of samples from different mills in Minnesota were tested, including samples of patent, straight, first clear, and second clear flours. The method employed was as follows:

One gm. of flour was placed in a mortar and triturated with about 25 cc. of distilled water and then washed into a bottle with 75 cc. of water. The bottle was connected with a eudiometer and a separatory funnel, through which, after the water level in the eudiometer had been brought to zero, 5 cc. of a perhydrol (30 per cent H_2O_2) solution was admitted to the flour suspension. The first reading of the evolved gas was made at the end of 30 minutes, the second and last at the end of an hour.

Tables are given showing the source and grade of the samples, their ash content, and catalase activity expressed in terms of cubic centimeters of oxygen evolved in 30 and 60 minutes with a 1 gm. charge of flour. The results show a close but not exact parallelism between the percentage of ash and the quantity of oxygen evolved. The catalase activity increases at a more rapid rate than the percentge of ash, which is of distinct advantage in distinguishing between the various grades of flour. An additional advantage of this procedure is that it can be made in shorter time and with less expensive apparatus than the ash determination. The author considers the test to be of considerable value in indicating the grade of flour.

Wheat bran, its substitution and adulterations, E. COLLIN (*Ann. Falsif., 10 (1917), No. 109–110, pp. 539–554, figs. 12*).—This article describes the physical, chemical, and microscopic characteristics of wheat bran and of the various substances used to adulterate it, such as the husks of various cereals, cornstalks, peanut shells, sawdust, and mineral matter, as sand, chalk, etc. Attention is called especially to the occasional presence in commercial bran of castor-bean meal, which is exceedingly poisonous to animals.

Poisonous bread and flour: Characterization and determination of sapotoxins, L. STŒCKLIN (*Ann. Falsif., 10 (1917), No. 109–110, pp. 561–572, figs. 3*).—Attention is called to the possible presence in flour not highly milled of poisonous grains, particularly fennel, which can be eliminated from wheat only with great difficulty. The presence of fennel in flour may cause the war bread made from the flour to be injurious to the health on account of the sapotoxins contained in it.

The author reviews the chemical and physical properties of the sapotoxins and describes a method of detecting their presence in flour by means of their hemolyzing action on blood. The materials employed for the reaction are an

artificial physiological solution of sodium chlorid and a 10 per cent blood emulsion. The flour to be examined is extracted with ether to remove the fat, and the sapotoxins are subsequently extracted by the physiological salt solution. The clear filtrate containing the sapotoxins is treated with 0.5 cc. of the blood emulsion and the time of hemolysis noted. Using fresh ox blood, a content of 6 to 8 per cent of fennel produces hemolysis in 35 to 45 seconds, 2 per cent in about 2 minutes, and 0.2 per cent after 2 hours. The author considers as "frankly toxic" a flour which, under the experimental conditions noted, hemolyzes within a minute; as "injurious to the health" within 15 minutes; and as "dangerous" or "suspected" up to 2 hours.

The rapidity of the hemolysis depends not only on the concentration of the sapotoxins but also on the temperature of the reaction, the nature of the blood, and the age of the blood emulsion. Diagrams are given showing the time of hemolysis with pure saponins at a temperature of 17° C., and with extractions of flour mixed with known proportions of fennel, using fresh ox blood for the hemolysis.

On the estimation of amino-acid nitrogen in the blood, S. OKADA (*Jour. Biol. Chem.*, *33* (*1918*), *No. 2*, *pp. 325–331*).—The author describes a modification of Bock's process (E. S. R., 37, p. 14) for the removal of proteins in the Van Slyke nitrous acid method for the determination of amino acids in blood. After coagulation of the blood at boiling temperature in weakly acid solution, the filtrate is thoroughly shaken with kaolin (20 gm. per 100 cc.) and immediately filtered through a folded filter. The first portion of the filtrate is usually cloudy, but on refiltering through the same filter a clear filtrate is obtained giving no turbidity or precipitation with trichloroacetic acid or picric acid and no biuret action. The filtrate rarely exhibits any tendency to froth.

Experimental data comparing the various methods of precipitation show no appreciable differences in results between this method and the heat-trichloroacetic precipitation method of Bock, but the new method is recommended as being "accurate, less troublesome, saving in time, and economical."

A rapid colorimetric method for estimating glucose in urine, V. I. ISAACSON (*Jour. Lab. and Clin. Med.*, *3* (*1918*), *No. 5*, *pp. 289–294*, *figs. 2*).—In this new method the amount of alkaline-copper sulphate solution reduced by the glucose is computed indirectly by determining with the aid of a colorimeter the amount left unreduced. The solutions used and methods employed are described in detail.

Italian turpentines, I–III (*Ann. R. Ist. Sup. Forestale Naz. Firenze*, *2* (*1916–17*), *pp. 155–181*, *fig. 1*; *182–189*; *190–202*; *Ann. Chim. Appl.* [*Rome*], *6* (*1916*), *No. 5–8*, *pp. 135–153*; *7* (*1917*), *No. 1–4*, *pp. 88–94*; *abs. in Chem. Abs.*, *11* (*1917*), *Nos. 1*, *pp. 97*, *98*; *12*, *pp. 1911*, *1912*).—Three studies are reported.

I. *Essential oil of turpentine of Pinus pinea*, F. C. Palazzo. Extensive studies are reported of the oil obtained from *P. pinea* with a view to its production and commercial use. As is true of other varieties of the Pinus family a high percentage of α-pinene was obtained. The fraction distilling from 175 to 180° C. was practically all *l*-limonene. Distillation of the oil gathered at different times of the year showed a marked variation due partly to climatic conditions, the largest amount of essence being obtained generally in April.

The author emphasizes the value of this essence of turpentine as a new source of *l*-limonene, which has a commercial use in the manufacture of artificial ethers, perfumed soaps, and varnishes, and on account of its high solubility in 90 per cent alcohol, high inflammability, and pleasant odor. It is claimed that it has a beneficent physiological action in cases of tuberculosis, and that its continued inhalation does not cause headache, vertigo, nor kidney affections.

II. *Italian turpentine from Pinus pinaster*, Mina Palazzo.—Analyses are reported of an industrial turpentine oil from *P. pinaster*, and also of an industrial turpentine oil produced in Italy consisting of a mixture of the turpentines of the maritime and domestic pines and varying in its composition according to the proportions of the two constituents. The oil contained 2.35 per cent resin and colophony oils as adulterants.

III. *Applications of the essence of turpentine from the domestic pines*, F. C. Palazzo and E. Azzarello.—Further studies of the properties of the essence of turpentine from the domestic pine (*P. pinea*) are reported. The drying power of the oil in enamels, varnishes, and paints compares favorably with that of the commercial oil of turpentine and technical limonene. Its notable solvent power for many substances combined with its high flame test make it a valuable solvent. Inhalation of the vapor does not produce the narcotic effect of the ordinary oil of turpentine.

Fats and fatty acids from petroleum, R. J. Moore and G. Egloff (*Metallurg. and Chem. Engin., 18 (1918), No. 6, pp. 308–311, fig. 1; Oil, Paint and Drug Reporter, 93 (1918), No. 18, pp. 59, 60*).—This paper shows the extent to which the synthetic production of fats and fatty acids from hydrocarbons present in petroleum oil has been successful. The past work on the subject is reviewed under the following methods: (1) Through halogenation of aliphatic hydrocarbons, (2) by way of Grignard's reaction, (3) by way of naphthenes, and (4) through direct oxidation of paraffins or olefins. Preliminary experiments have been conducted by the authors of passing vaporized kerosene and chlorin after heating into an electrical silent discharge field of high potential, adding carbon dioxid at the same time. Indications are that a certain amount of fatty acids is formed under these conditions.

Data in regard to a new oil extracted from Blepharocalyx gigantea (Horcomolle), F. Zelada (*An. Soc. Quím. Argentina, 5 (1917), No. 21, pp. 226–237, figs. 3; Univ. Tucumán, Inform. Dept. Invest. Indus., 1917, pp. 5–13, figs. 3*).—A study of the Horco-molle, a tree which grows abundantly in Tucumán, within the subtropical zone, showed that from it could be extracted a new oil which, because of its agreeable aroma and easy extraction, could be incorporated into perfumes. The botanical and histological properties of the tree are summarized and the following analytical constants given:

Density at 15° C., 0.9188; boiling point at 760 mm., 169.9°; specific rotation at 28°, −2° 22′; index of refraction at 27.5°, 1.4732; solubility in 80 per cent alcohol 6.1, in 90 per cent alcohol 3.7; saponification number, 56 mg.; percentage of ether, 18.164; percentage of alcohols, 15.66; acetyl number, 172 mg.; percentage of total alcohol, 31.563; and percentage of free alcohol, 15.903. The oil gave as color reactions with sulphuric acid, an intense red; with nitric acid, a brownish red; and with hydrochloric acid, a greenish red color.

Power alcohol: Proposals for its production and utilization in Australia (*Aust. Advisory Council Sci. and Indus. Bul. 6 (1918), pp. 69, figs. 2*).—This publication includes a general discussion of the question of liquid fuels in Australia, the advantages of alcohol as a fuel, the available sources for its production with the relative cost of the product from each source, the engine problem with proposed alterations necessary to existing types of internal-combustion engines, the utilization of by-products in distillation of alcohol, and Government regulation for the manufacture and denaturation of industrial alcohol.

The crops suggested as promising for cultivation as raw material for the manufacture of power alcohol are green sorghum stalks, sorghum grain, cassava, and sweet potatoes. As these crops are not grown at all or only on a small scale in Australia at the present time, their development may lead to the cultivation of areas unsuited for other crops, and so may assist in diversification.

It is recommended that power alcohol be denatured with 2 per cent of either the fractions of coal-tar oil distillates obtained at a temperature of from 170 to 230° C. or with creosote oil.

Actual state of our knowledge of microbiological retting.—Applications in the study of retting of colonial textiles, F. Heim and Rullier (*Bul. Off. Colon.* [*France*], *10* (*1917*), *No. 118–120, pp. 621–639*).—This is a review of the literature on the subject of the mechanism of the retting of flax and hemp and the organisms which are involved in the process, with a view to the establishment of a series of experiments in regard to the retting of colonial textile fibers. The authors suggest that, since the retting organisms in tropical countries are probably different from those in European countries, it is logical to attempt to isolate the organisms acting naturally upon the vegetable tissues in the Tropics rather than to study the effects on these textile tissues of the microorganisms involved in the retting of European fibers.

Chemicals in use in the rubber industry and their applications, A. J. Ultée (*Arch. Rubbercult. Nederland. Indië, 1* (*1917*), *No. 5, pp. 403–412*).—This is a general discussion of the various chemicals in use for coagulation, anticoagulation, bleaching, and disinfection.

The chemical composition of Hevea latex, K. Gorter (*Arch. Rubbercult. Nederland. Indië, 1* (*1917*), *No. 5, pp. 375–377*).—The following analysis of Hevea latex is reported per liter of latex: Rubber after coagulation with acetic acid, 370 gm.; and serum, 29.1 gm. The composition of the serum was ash, 5.3 gm.; protein, 3.4 gm.; quebrachite, 14.5 gm.; and sugar, 2.5 gm.

Investigations in regard to the influence of protein hydrolysis products on the velocity of vulcanization of rubber were conducted by treating 185 gm. of rubber with 15 gm. of sulphur and 0.37 gm. of leucin and comparing the vulcanization time with that of the same amounts of rubber and sulphur without the leucin. The time of vulcanization with leucin was 105 minutes, and for the control 115 minutes. The author suggests that possibly amyl amin, which at high temperatures under the influence of carbonic acid breaks down into leucin, is the substance which acts as a vulcanization accelerator.

In regard to the possibility of manufacturing acetic acid on rubber estates, P. E. Keuchenius (*Arch. Rubbercult. Nederland. Indië, 1* (*1917*), *No. 5, pp. 413–417, fig. 1*).—Investigations conducted by the Central Rubber Station, Dutch East Indies, show that it is possible to manufacture acetic acid from alcohol by fermentation which is cheaper than the present market price of acetic acid, and which is satisfactory for coagulation of rubber. The simple apparatus required for the fermentation is described.

Home canning and curing of meats, M. Anna Hauser (*N. J. Agr. Col. Ext. Bul., 1* (*1917*), *No. 15, pp. 11*).—This publication gives general directions for canning meat and poultry, for curing meat by drying and smoking, and for utilizing the fat, scraps, and trimmings in various ways.

The canning and preserving of vegetables and fruits, H. S. Elliot (*Bien. Rept. Dept. Agr. Fla., 14* (*1915–16*), *pt. 2, pp. 148–162*).—This is a compilation of information on the above subjects from numerous sources. It includes a classification of the methods of food preservation, a definition of canning terms, useful tables for the canner, general directions for preserves, jellies, and marmalades, and special directions for bottling the juice of grapefruit.

Canning chart, directions, and recipes, compiled by Dilla E. Wimple (*Ann. Rpt. So. Dak. Hort. Soc., 13* (*1916*), *pp. 28, 29*).—A two-page chart is given with explanations and suggestions for canning by the cold-pack method. Some recipes are included and a bibliography of bulletins on canning is appended.

How to utilize and preserve our fruits with the present scarcity of sugar, A. Truelle (*Vie Agr. et Rurale, 7* (*1917*), *No. 39, pp. 220–223*).—The author has

described the preparation of different products from apples and pears according to old recipes without the use of sugar.

Fruit and vegetable drying.—Types and models of driers, F. L. OVERLY (*Iowa State Col., Agr. Ext. Dept., Emergency Leaflet 23 (1917), pp. 7, figs. 8*).—This leaflet discusses the advantages of drying and gives simple rules for drying. It also discusses various types of driers that are adapted to home use.

A successful community drying plant, C. W. PUGSLEY (*U. S. Dept. Agr., Farmers' Bul. 916 (1917), pp. 12, figs. 9*).—A successful community drying plant located at Lincoln, Nebr., is described. The principle employed is an adaptation of the electric-fan process of drying. A stream of dry air is drawn continuously across the products being dried. A detailed description of the drier is given with diagrams and a bill of materials for its construction. A convenient method of heating is described. The publication also contains suggestions for the preparation of fruits and vegetables for the drier and for the storing and cooking of the dried articles. The importance of community driers is emphasized, and a working scheme for their operation outlined.

METEOROLOGY.

Climatology, A. J. CONNOR (*Statis. Year Book Prov. Quebec, 1917, pp. 33–46, figs. 6*).—Tables are given which summarize data regarding temperature, precipitation, and sunshine at a number of stations in Quebec during 1916, as compared with preceding years. A method of combining temperature with rainfall to yield an index number for each month of the growing season is described, and the application of the method to the months of April to September, 1916, is illustrated. The limits of optimum temperature for plant growth as selected for this purpose were as follows:

Limits of optimum temperatures for plant growth in Quebec, April to September.

Period.	April.	May.	June.	July.	Aug.	Sept.
	° F.	° F.	° F.	° F.	° F.	° F.
Day, lower limit	60	60	70	70	70	60
Night, lower limit	43	43	50	50	50	43

"For each station the number of days with a temperature equal to or exceeding the limit in the respective months was counted and tabulated and also the number of nights in which the temperature did not fall below the assigned limit. In effect this procedure measures the number of days which received a sufficient quantity of heat and gives no weight to heat in excess."

Regarding rainfall, it is stated that for the crops usually grown in Quebec "the efficiency of the moisture . . . in promoting growth increases rapidly and directly with the rainfall at first, but after the rainfall has reached the neighborhood of 4 in. for the month it is evident that normally a much smaller additional quantity will suffice to maintain the soil in a condition sufficiently moist for agriculture. Some method of weighting the rainfall figures is, therefore, required which will give the greatest weight to increase in rainfall below some assigned limit and little or no weight to increase above the same limit. . . . The rainfall totals (for each month) may be considered as ranging upward from zero without limit, and it is therefore always possible to find an arc of which the rainfall total is the natural tangent. Thus, for example, if the rainfall be 0.3 in., we have 0.3 as the tangent of 16° .42′; or if the rainfall be 4.5 in., we have that the tangent of 77° .28′ is 4.5. Further, after the corresponding arc is

found, we can always determine its natural sine. Thus, in the examples now quoted, the sines of 16° .42′ and 77° .28′ are known, respectively, to be 0.287 and 0.976. The final measure of the influence of the rainfall of 0.3 in. is 0.287 and of 4.5 in. is 0.976. A reference to the diagram (fig. 1) will show how rapidly the measure increases with the rainfall at first, but that after the rainfall has reached what we assume to be near the optimum amount the measure becomes practically constant."

The figures for temperature and rainfall are combined by means of a triangle, one side of which has units of length equal in number to the number of sufficiently warm days and the other units of length corresponding to the number of sufficiently warm nights. " If the angle between these two sides be the angle whose tangent is the rainfall, then the area of the triangle is equal to the product of those two sides into half the sine of the included angle. Or more briefly,

$$\text{Index-area} = Fd \times Fn \times \tfrac{1}{2} \text{ sine arc tan R}$$

where Fd is the frequency of warm days, and Fn the frequency of sufficiently warm nights, and R is the total rainfall for the month. Now, since the frequencies and the rainfall are variable for the months and for the stations, we shall obtain a series of areas which may be entered on a map and differentiated by lines in the usual manner." Charts illustrating the application of the method are given.

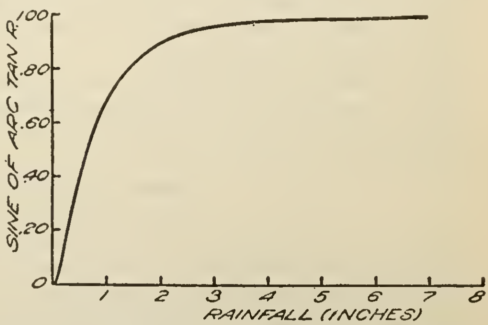

FIG. 1.—Efficiency of varying amounts of rainfall.

Where wheat is grown (*U. S. Dept. Agr., Nat. Weather and Crop Bul., No. 7 (1918), pp. 2, 3, figs. 3*).—Two charts illustrating the distribution of winter wheat growing in the United States and one chart showing the world wheat acreage are given and discussed. It is stated that " the ideal climate for wheat is one with a long and rather wet winter, prolonged into a cool and rather wet spring, which gradually fades into a warmer summer, the weather growing gradually drier as it grows warmer, with only comparatively light rains after the blossoming of the crop, just enough to bring the grain to maturity, with abundant sunshine and rather dry air toward the harvest, but without dry and scorching winds until the grain is fully ripe; and then hot, dry, rainless weather until the harvest is gathered."

Spring frosts (*U. S. Dept. Agr., Nat. Weather and Crop Bul., No. 4 (1918), pp. 2, 3, 7, 8, figs. 3*).—Three charts are given and explained showing (1) dates of planting in seven zones into which the eastern part of the United States has been divided, (2) dates in spring when killing frost occurs on the average only 1 year in 10, and (3) average dates of last killing frost in spring.

Storm rainfall of eastern United States, A. E. MORGAN and C. H. PAUL (*Miami [Ohio] Conserv. Dist., Tech. Rpts., pt. 5 (1917), pp. 310, pls. 3, figs. 111*).—This report gives in detail the results of an extended study of storm rainfall and run off in the United States east of the 103d meridian.

This study was undertaken in connection with an engineering examination of the Miami Valley, begun immediately after the subsidence of the great flood of March, 1913, for the purpose of determining the best plan for preventing damage by future floods. Every record of storms of consequence within the

area named was utilized in compiling the data reported. In compiling and analyzing the data particular attention was given to duration, intensity, and distribution of precipitation, the factors which are of most interest to engineers in general and of vital importance in investigations pertaining to flood control. A detailed analysis is given of the time-area-depth relations of 33 important storms, the aggregate extent of which reached to nearly every part of the eastern United States. For the benefit of those not especially versed in meteorological matters there is given a brief summary of the well-established meteorological facts which are most necessary for understanding and interpreting the results of the investigation. Snowfall was not considered in the investigation because it has been found to be a negligible quantity in relation to floods in the Miami Valley.

The primary object of the investigation was to reach safe and logical conclusions as to the probable size and frequency of floods in the Miami River, with a view to the working out of plans for protecting the valley against floods. The general conclusion reached was that an adequate flood-protection plan should "provide against a hypothetical storm which would cause a maximum flood run-off almost 40 per cent in excess of that of the storm of March 23–27, 1913, the latter having caused the greatest rate of run-off during the 100 years of record for the Miami River."

The desiccation of the earth, C. F. von Herrmann (*Science, n. ser., 47 (1918), No. 1217, p. 417*).—This is a brief note referring to the formation of hydrogen by electrical discharges in the atmosphere as a cause of desiccation of the earth.

SOILS—FERTILIZERS.

Soil survey of Meriwether County, Ga., M. Baldwin and J. A. Kerr (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 31, pls. 2, fig. 1, map 1*).—This survey deals with the soils of an area of 318,720 acres in west-central Georgia lying wholly within the Piedmont Plateau province. The topography is generally rolling, with drainage well established.

"The soils of the county are derived from igneous and metamorphic rocks, chiefly granite, granite-gneiss, mica schist, hornblende schist, quartz schist, and quartzite. The upland soils are residual from these rocks, while the alluvial soils consist of material washed from the uplands and deposited by streams." Eighteen soil types of 8 series are mapped, in addition to meadow (Congaree material). Cecil sandy clay loam and Cecil sandy loam predominate, occupying 32.2 and 19.7 per cent of the total area, respectively.

Soil survey of Richmond County, Ga., T. M. Bushnell and J. M. Snyder (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 38, fig. 1, map 1*).—This survey deals with the soils of an area of 202,240 acres situated in northeastern Georgia. The greater part of the county lies within the Coastal Plain province, the surface being reduced by stream erosion to a series of valleys and broad, level ridges with gentle to steep slopes. The extreme northern portion of the county, comprising rolling, somewhat broken land, lies in the Piedmont Plateau province, while alluvial flood plains and terraces are extensively developed along the Savannah River, which borders the county on the east.

Twenty-seven soil types, including two phases, of 16 series have been mapped, in addition to meadow, swamp, and rough broken land. Norfolk sand, including the sand-hill phase, is the chief type, occupying 33.8 per cent of the total area of the county.

Kane County soils, C. G. Hopkins, J. G. Mosier, E. Van Alstine, and F. W. Garrett (*Illinois Sta. Soil Rpt. 17 (1917), pp. 60, pls. 2, figs. 8*).—Kane County

is situated in the northeastern part of the State, lying in three glaciations and comprising an area of 513 sq. miles. A small portion of the northwest corner of the county is in the Iowan glaciation, but the material deposited by that glaciation has been almost entirely covered by a late Wisconsin gravel outwash. The east and northeast parts of the county lie in the late Wisconsin glaciation, while the western and southern parts of the county are in the early Wisconsin glaciation. The Illinoisan glaciation preceded all the glaciations named, covering the area with a layer of drift 20 to 60 ft. deep. The topography of the county is undulating to slightly rolling in the intermorainal tracts, while the morainic areas are composed of a series of irregular ridges containing many kettle holes now mostly filled with partially decayed vegetation. Natural drainage is said to be frequently imperfect, and, although no large lakes exist in the county, many swamps occur that need artificial drainage.

The soils of the county include (1) upland prairie soils, (2) upland timber soils, (3) terrace soils, and (4) late swamp and bottom land soils, covering, respectively, 46.37, 29.48, 4.73, and 18.8 per cent of the area. Chemical analyses of the various soil types are reported.

The fertility needs and methods of management of the soils are fully discussed.

Soil survey of Kimball County, Nebr., A. H. Meyer, J. O. Veatch, B. W. Tillman, F. A. Hayes, H. C. Mortlock, and C. E. Collett (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 28, fig. 1, map 1*).—This survey, made in cooperation with the Nebraska Soil Survey, deals with the soils of an area of 613,120 acres in the extreme western part of the State and lying within the Great Plains province. The county is a high, nearly level to moderately rolling, practically treeless plain with an elevation of from 4,800 to 5,300 ft. above sea level. Drainage is generally good.

"The soils of the county are prevailingly light brown in color at the surface with grayish, highly calcareous subsoils having a loose, friable structure. Over the greater part of the county the soils are residual in origin, the material being derived entirely from a single geologic formation. The soils derived from alluvial deposits constitute about 10 per cent of the area of the county." Twelve soil types of 5 series are mapped, in addition to rough broken land. Sidney loam, Sidney gravelly sandy loam, and Sidney silt loam predominate, occupying 40.3, 28.9, and 12.8 per cent of the total area, respectively.

The experimental determination of a dynamic soil moisture minimum, H. E. Pulling (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 186–188*).—It is stated that a method has been devised by the use of which soil samples may be obtained with so small a water content that during 24 hours only about 0.001 gm. is moved through a space having a cross section of 30 sq. mm. The graphs obtained by plotting the data are discussed with their bearings.

Moisture equilibrium in pots of soil equipped with auto-irrigators, F. S. Holmes (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 208–210*).—The author has employed the auto-irrigator devised by Livingston, studying the details of adjustment required by this device for different soils and different moisture contents. Three soils were used, medium fine white sand, light clay loam, and a mixture of volumetrically equal parts of the two, each being tested, with auto-irrigators having 1, 3, and 5 porous cups, respectively.

Approximate equilibrium of the soil moisture content was reached in 75 days for the loam, 80 for the mixture, and 90 for the sand. The number of porous clay cups appeared to influence the period required to attain equilibrium in case of the sand but not in case of the loam or the loam-sand mixture. The larger the number of cups, the sooner equilibrium was reached. With a pressure of 5.5 cm. of a column of mercury, the soil moisture content at equilibrium

was too low for plant cultures in the sand and perhaps also in the loam-sand mixture, but in the loam it appeared to be capable of supplying the plants with sufficient water for growth under ordinary greenhouse conditions.

Relation of carbon dioxid to soil reaction as measured by the hydrogen electrode, D. R. Hoagland and L. T. Sharp (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 3, pp. 139–148*).—In continuation of work at the California Station, previously noted (E. S. R., 36, p. 117), the authors studied more fully the question of the effect of carbon dioxid on soil reaction as determined by the hydrogen electrode.

The apparatus used was the same as that employed in the previous work. "To provide a chamber for mixing the hydrogen and carbon dioxid a graduated 1,000-cc. cylinder, the base of which had been cut off, was immersed in a larger cylinder filled with mercury. The upper end of the inner cylinder was tightly stoppered and contained two capillary stopcocks for admission and outlet of the gases. A definite quantity of purified hydrogen, electrolytically generated was admitted to this cylinder through one stopcock. Through the other stopcock there was admitted from a gas burette a known quantity of pure carbon dioxid. Both gases were measured at atmospheric pressure. A sufficient time was then allowed for the thorough diffusion of the gases, which was aided by raising and lowering the inner cylinder. The reservoir of mixed gases was then connected to the hydrogen-electrode chamber which contained the soil suspension. Forty to 70 cc. of the gas mixture were forced into the space above the soil suspension, adjusted to atmospheric pressure, and the hydrogen-electrode cell was then closed. Equilibrium was hastened by the shaking method, and the voltmeter readings were noted. This procedure was repeated with new portions of the gas mixture until the voltmeter readings were constant to within 0.005 volt."

The H-ion concentrations of soil suspensions were measured under various partial pressures of carbon dioxid. It was found that "the H-ion concentration of suspensions of acid soils was not markedly affected by increasing the content of carbon dioxid up to 10 per cent. The H-ion concentration of slightly alkaline soils was slightly increased by such treatments. A notable increase in H-ion concentration was observed when soils containing alkali carbonates were similarly treated." None of the carbon dioxid treatments produced an alkaline reaction in suspensions of an acid soil, and when the original conditions were restored there was no permanent change in soil reaction which could be attributed to the carbon dioxid. The point of view that solutions in equilibrium with acid soils contain H ion in excess of OH ion was confirmed.

A short bibliography of the subject is given.

[Partial sterilization of soil], E. J. Russell (*Country Life* [*London*], *42 (1917), Nos. 1092, p. 548; 1093, pp. 578, 579, figs. 6*).—The history and general principles of soil sterilization as a means of increasing productiveness are briefly discussed, and methods in practical use in England, particularly by tomato growers, are described. In one of the methods most successfully used steam is blown from a boiler under a large tray 6 by 8 ft. placed on the soil, and it rapidly penetrates and heats the soil to a depth of 8 or 9 in.

The search for a suitable antiseptic soil sterilizer which will also be an effective insecticide is referred to. This is considered a great national need in England, since so much grassland has to be plowed up, and "wireworms, leatherjackets, and other pests appear in the young crops on the freshly broken land and do considerable damage."

Humification of compounds entering into the composition of vegetable matter, A. G. Trusov (*Selsk. Khoz. i Lîesov., 252 (1916), Nov.-Dec., pp. 26–47*).—This is a continuation of work previously noted (E. S. R., 38, p. 26).

Experiments on the formation of so-called humin acid in mixtures of leaves with various organic substances showed that lignin, tannic acid, and albuminous substances, and some vegetable oils are sources of humin acid, while cellulose, starch, glucose, gum, and cork are not. The amount of humin acid was greatly decreased by the elimination of substances soluble in water and alcohol from decomposed vegetable remnants. More humin acid was washed into the soil from steppe grass than from the same amount of forest litter.

Papilionaceous plants gave only humin acid soluble in water.

The decomposition of sweet clover (Melilotus alba) as a green manure under greenhouse conditions, L. A. Maynard (*New York Cornell Sta. Bul. 394 (1917), pp. 121–149, figs. 3*).—This reports the results of investigations conducted during 1914 and 1916 relating to the use of sweet clover as a green-manure crop, with special reference to the ability of the plant to gather nitrogen and the rate of decay of the plant when incorporated with the soil. Volusia silt loam soil was employed in the experiments, the plants being grown in pots in the greenhouse. The soil was inoculated with a pure culture of the sweet clover organism. In one series of pots the lime requirement was satisfied by the use of slaked lime, in a second series by finely ground limestone, while a third series was left unlimed. Seed tested for germination showed a germination percentage after four days of from 28 to 32 for untreated seed, and of from 95 to 98 for seed treated by the sulphuric-acid method described by Love and Leighty (E. S. R., 27, p. 524).

The investigations during 1914 comprised a study of the yield and composition of the sweet-clover plant after a period of growth of 62, 89, and 118 days, respectively, for both the limed and unlimed pots. Data are also presented on the formation of nitrates in pots having the plants removed or turned under after a growth of 89 and of 118 days for a four-month period.

The 1914 results having indicated that the four-month period of growth gave the best results from the standpoint of the amount of available green manure produced, it was decided to grow the plants for that period in 1916 before turning them under. Data similar to that noted above are, therefore, presented for plants grown 116 days.

In discussing the results obtained statistical methods are employed so far as possible with regard to the production of dry matter and nitrogen, percentage of fiber, and rate of decay.

Recognizing the desirability of repeating the experiments under field conditions before drawing general conclusions, the author summarizes his studies as follows: "These experiments show that sweet clover will make a satisfactory growth for use as a green manure in three or four months on a worn-out soil, provided the lime requirement is satisfied. When the crop is harvested at either of these periods it compares favorably in nitrogen content with other legumes, and sufficient fiber has not developed to inhibit rapid decay. Growing the crop for the longer period does not result in an increased proportion of fiber.

"The plant responds readily to inoculation with the appropriate organism. To secure a good stand the seed bed should be compact and treated seed should be used. The use of treated seed is important also from the standpoint of economy. Treating the seed with acid increases the percentage of germination threefold, and seed so treated does not lose its increased germinating power for at least ten months. Satisfying the lime requirement of the soil was found to increase the yield 50 per cent for the crop grown four months. . . .

"Sweet clover grown for three or four months decays rapidly when used as green manure. It was found that in the limed pots sufficient nitrates had been

produced four months after harvest to account for approximately 50 per cent of the nitrogen added in the material turned under. From the standpoint of the amount of available plant food, it is desirable that sweet clover, to be used as a green manure, should be grown for at least four months.

"The measurement of nitrate formation in pot experiments is subject to a large probable error. This fact is a real objection to the method as a quantitative measure of rate of decay."

A bibliography of 22 titles is appended.

Composition of fallen leaves of forest trees and their quantities, S. MORIYA (*Extracts from Bul. Forest Expt. Sta., Tokyo, 1915, pp. 28–33; abs. in Chem. Abs., 11 (1917), No. 10, p. 1513*).—To ascertain the manurial value of fallen leaves of forest trees the fallen leaves of sugi (*Cryptomeria japonica*), akamatsu (*Pinus densiflora*), kuromatsu (*Pinus thunbergii*), kunugi (*Quercus serrata*), konara (*Quercus glandulifera*), and shirakashi (*Quercus vibrayana*) were collected and analyzed.

"The most important ingredient of fallen leaves is no doubt nitrogen. Among conifers, the sugi leaves are richest in nitrogen, containing 0.972 per cent, or about 1 per cent of the air-dried substance. Sugi is followed by akamatsu, showing a percentage of 0.885, and kuromatsu, of 0.855. Broad leaves are generally richer in nitrogen than needle leaves, those of kunugi containing 1.116 per cent, shirakashi 1, and konara 0.945.

"Broad-leaved trees have a larger proportion of ash in their leaves than conifers. Among conifers, sugi, however, is relatively rich in ash, containing 6.1 per cent of the air-dried substance, which is three times that of the ash content of akamatsu or kuromatsu. Among broad-leaved trees, kunugi has an ash content of 3.55 per cent, while konara contains nearly twice as much as the preceding, and shirakashi has a still larger quantity, the content being 9.12 per cent.

"Taking the three important ash ingredients known as phosphoric acid, potash, and lime among the fallen leaves of the six aforesaid trees, sugi leaves are richest in phosphoric acid and lime. Its richness in lime is particularly noteworthy, as it contains 2.999 per cent of the air-dried substance, or 49.164 per cent of the total ash. Phosphoric acid, too, is found in considerable amount in sugi leaves. Akamatsu and kuromatsu leaves . . . are rich in phosphoric acid, being not inferior to those of broad-leaved trees, although they are poor in potash content. The content of silica in kuromatsu is richer than that in akamatsu, and to this is due the difference in the total ash content of the two pines, though there is no particular difference in other ingredients of the ash. Further, among broad-leaved trees, shirakashi and konara are rich in ash content owing to the large amount of silica, while phosphoric acid and lime are found almost in the same quantity as in other oaks such as kunugi. Shirakashi is further characterized by the rich content of potash."

With the object of determining the difference in the composition of fresh fallen leaves and well-rotted ones, samples were taken from beds of well-rotted leaves in the spots where fallen leaves were collected. It was found that "well-rotted leaves are richer in nitrogen than fresh fallen leaves. Since well-rotted leaves of akamatsu and kunugi contain 1.5 per cent of nitrogen in round numbers, they both have a certain manurial value owing to their nitrogenous content. . . . Compared with freshly collected leaves, the silica, magnesia, and oxid of iron contained in the ash of well-rotted leaves are remarkably large in quantity. Phosphoric acid, potash, and lime are, however, gradually washed away and decrease with the lapse of years."

Studies of the soils of sugi, akamatsu, and kunugi woods showed them to differ considerably in composition. "This is chiefly due to the difference of tree

species, the age and [spacing] of the standing trees, as well as the other forest conditions. One point common to the three lots is the richness in nitrogen, phosphoric acid, potash, and lime."

The utilization of sewage water in Italy, A. AITA (*Italia Agr., 53 (1915), No. 11, pp. 499–502; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 1, pp. 30–32*).—Analyses of the sewage waters of several Italian cities and of night soil from Cremona are reported and discussed.

The author is of the opinion that with normal coal prices the manufacture of ammonium sulphate in Italy from the supernatant liquid from settled night soil would be worth while, especially in the smaller towns. Large-scale experiments by him showed the impracticability of the method of extracting ammonia by the prolonged effect of a current of air passing through the liquid. A brief description is also given of the treatment of the solid residues as carried out in England and Germany to extract the fatty matter.

Commercial fertilizers in war time, C. E. THORNE (*Mo. Bul. Ohio Sta., 3 (1918), No. 1, pp. 3–7, figs. 2*).—Reviewing the results of experiments extending over several years at four different places in Ohio, the general conclusion is reached that "acid phosphate may be used with certainty of a profitable increase of crop under existing market conditions, but that the additional increase produced by adding nitrogen or potassium to the phosphate is likely to be worth less than the added cost of the fertilizer." The results also emphasize the importance under present conditions of the systematic production and careful saving and use of animal manures.

The influence of sodium nitrate upon nitrogen transformations in soils with special reference to its availability and that of other nitrogenous manures, D. A. COLEMAN (*Soil Sci., 4 (1917), No. 5, pp. 345–432, fig. 1*).—This is a report of a detailed study of the influence of sodium nitrate on ammonification of dried blood and cottonseed meal in acid and alkaline soils and in the presence of acid phosphate or potassium chlorid, or both; on nitrification of ammonium sulphate, dried blood, and cottonseed meal; and on nitrogen fixation; as well as observations upon nitrate transformation by soil microorganisms. Seven typical sandy, loam, and muck soils from different parts of the country, as well as "niter spot" soils from Colorado, were used in these studies. The data are tabulated and discussed in considerable detail and the more pertinent results of the investigations summarized.

Applications of sodium nitrate markedly increased the simplification of protein material applied to soils, the results varying somewhat with the source of the organic matter. For example, cottonseed meal was ammonified to a larger extent in the presence of sodium nitrate than was dried blood.

Acid phosphate increased the ammonification of dried blood nitrogen, but sodium nitrate added as a limiting factor did not stimulate the decay of the material. Potassium chlorid had a slight stimulating effect in some soils while in others no action was observed. Sodium nitrate decreased ammonia accumulation in soils supplied with dextrose. Combined in the proper proportions, sodium nitrate, acid phosphate, and potassium chlorid increased the simplification of organic matter to a greater extent than any one of these substances alone.

Sodium nitrate lost its stimulating power to a great extent in alkaline soils due, it is explained, to an increased number of bacteria which assimilated a considerable proportion of the simplified material, and also to a rearrangement of the soil flora. Of the soil flora studied the soil fungi responded most to applications of sodium nitrate with the bacteria next.

The stimulating influence of sodium nitrate was found to be due to the anion.

Sodium nitrate stimulated the nitrification of dried blood, cottonseed meal, and to a less extent ammonium sulphate. This stimulative action was not apparent, secondary reactions, such as increased cell division, with a subsequent assimilation of nitrates, masking the end point. Large quantities of sodium nitrate depressed nitrification, the amount of the depression depending first upon the sources of nitrifiable material and second upon the soil type. In large quantities sodium nitrate became toxic first to the nitrification of ammonium sulphate, then to dried blood, and lastly to cottonseed meal.

Sodium nitrate in amounts up to 5,000 lbs. per acre affected Nitrobacter the same as Nitrococcus, while in amounts beyond 5,000 lbs. it stopped the activities of Nitrobacter but not those of Nitrococcus. Sodium nitrate in small quantities stimulated nitrogen fixation by Azotobacter and in large quantities depressed it.

Large quantities of nitrates were assimilated by organisms in the soils, the amount so assimilated being approximately 20 per cent of the nitrogen applied. Apparently calcium nitrate was as readily assimilated as sodium nitrate. Experiments on the nitrifiability of microbial matter gave widely varying results.

Of the three nitrogen-transforming groups, sodium nitrate affected the nitrogen-fixing group most adversely, the nitrifying group to a lesser degree, and the ammonifying group least. As used in agricultural practice, sodium nitrate generally stimulates the activity of the ammonifying and nitrifying groups, but depresses the activity of the nitrogen-fixing group. In no case is it thought to cause toxicity if applied rationally.

It is concluded that "the entire study of the influence of the sodium nitrate upon nitrogen transformations in soils seems to indicate rather strongly that in the cases where larger quantities of nitrogen are recovered in the crop than can be accounted for by the amount of sodium nitrate applied this is due to a drawing on the soil's own nitrogen supply. This supply is acted upon by a stimulated bacterial flora, brought about by the presence of sodium nitrate. On the other hand, where more or less of the nitrogen applied is recovered the variations in the recovery may in a large measure be explained on the grounds of assimilation of nitrates by soil organisms."

The literature of the subject is reviewed at some length and a bibliography of 226 titles is given.

Influence of nitrates on nitrogen-assimilating bacteria, T. L. Hills (*U. S. Dept. Agr., Jour. Agr. Research, 12* (*1918*), *No. 4, pp. 183–230*).—This is a report of investigations contributed from the Wisconsin Experiment Station, on the influence of ammonium, potassium, sodium, and calcium nitrates in amounts varying from 10 to 300 mg. per 100 gm. of dry soil on the growth and physiological activities of Azotobacter and *Bacillus radicicola* in sterilized silt loam soil containing 2.75 per cent of organic matter and 1.5 mg. of nitrate per 100 gm. of dry soil. The following is a summary of the results:

"Small quantities of potassium, sodium, and calcium nitrates caused a great increase in the number of Azotobacter in sterilized soil. Ammonium nitrate in the same quantities caused a less marked increase. Higher concentrations were not so favorable to the growth of the organisms.

"Potassium and sodium nitrates in the concentrations studied caused an increase in the amount of nitrogen assimilated by Azotobacter on agar films. Calcium nitrate in the same amounts brought about a decrease in the amount of nitrogen fixed to a point even below that representing the amount assimilated in the absence of nitrates. In soil cultures nitrates of sodium and calcium caused an increase in total nitrogen, which was more marked in the unsterilized cultures than in those cultures sterilized and inoculated with a pure culture of Azotobacter. However, the increase in total nitrogen is not commensurate with the increase in the number of Azotobacter noted under the same conditions.

"Under aerobic conditions Azotobacter in liquid cultures reduced nitrate to nitrite, but not to ammonia. More atmospheric nitrogen was assimilated in the presence of nitrate than in the absence of this salt.

"Pigmentation occurred when potassium and sodium nitrates, and especially calcium nitrate, were used with Azotobacter, the coloration increasing with the concentration of the salt. This effect was more marked in Azotobacter strains which produce little or no pigment in the absence of nitrates.

"All three nitrates studied caused an increase in the number and size of volutin bodies in Azotobacter cells. From all appearances these salts also tended to hasten the development of these bodies.

"The number of *B. radicicola* in sterilized soil was increased by the addition of small quantities of potassium, sodium, ammonium, and calcium nitrates. This increase was not so marked as in the Azotobacter cultures. *B. radicicola* appeared to be much more resistant to higher concentrations of nitrates than Azotobacter.

"*B. radicicola* under aerobic conditions did not reduce nitrates in solution to nitrite, ammonia, or elemental nitrogen. The presence of nitrates did not materially influence the small amount of atmospheric nitrogen fixed under these conditions. When grown on agar films, *B. radicicola* fixed a small amount of nitrogen, varying from 0.15 to 0.43 mg. of nitrogen in 100 cc. of the medium. The addition of various amounts of potassium, sodium, and calcium nitrates increased to a slight extent the amount of nitrogen assimilated. In liquid cultures all three nitrates caused a large increase in the amount of gum obtained by precipitation with acetone.

"The presence of large amounts of potassium, sodium, and calcium nitrates proved detrimental to the formation of nodules on alfalfa. *B. radicicola* did not appear to lose its infecting power when grown on media containing varying amounts of sodium and calcium nitrates. Alfalfa seedlings grown in the presence of large amounts of nitrate did not produce nodules when inoculated with a viable culture of *B. radicicola*. Nitrates in soil cultures prevented the reformation of nodules once removed and also caused a decrease in the number of nodules already present."

A list of 49 references to literature cited is given.

The addition of tar to calcium cyanamid to facilitate spreading, SCHMOEGER and LUCKS (*Mitt. Deut. Landw. Gesell., No. 10 (1917), pp. 156, 157; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 6, pp. 842–844*).—"In experiments carried out at the agricultural station at Danzig (Prussia) to find, if possible, a method to facilitate the spreading of calcium cyanamid, good results were obtained by mixing the manure with 15 per cent of coal tar.

"The cyanamid is first mixed with the tar and then passed through a mincing machine. The material thus obtained is rather similar to superphosphate. It may be easily spread without powdering, a characteristic which it does not lose even when kept for a long time. The addition of tar causes no loss of nitrogen.

"In order to determine whether the addition of tar is harmful to plants fertilized with cyanamid, pot-manuring experiments were carried out with oats during the summer of 1915. The plants grew equally well in pots treated with cyanamid and tar as in those treated with pure cyanamid or with ammonium sulphate, and much better than in pots without nitrogenous manure. . . .

"In April, 1916, a second experiment was begun. This was carried out with ten pots divided into five equal groups treated respectively with the following manures: (1) No manure, (2) pure calcium cyanamid, (3) cyanamid plus

10 per cent of tar, (4) cyanamid plus 25 per cent of tar, and (5) ammonium sulphate. In each pot were sown 20 oat seeds, in five immediately after manuring, and in the other five a fortnight later. The pots were kept in the garden throughout the whole experiment. Sprouting was normal in all the pots, but shortly after, the plants which had not been manured showed less vigor. . . . The plants matured well and gave the following average yields: (1) Grain 7.1, straw 13; (2) grain 12.5, straw 24.2; (3) grain 12.4, straw 23.2; (4) grain 12.5, straw 21.6; and (5) grain 12.2, straw 24.3. Nitrogenous manure thus increased the yield by about 70 per cent without there being any visible difference between the various kinds. It may, therefore, be concluded that cyanamid had no harmful effect on the plants."

In 1915–16 the experiment was repeated with wheat in the open. Six plats of 614 sq. yds. each were used, three of these being treated with 35 lbs. of cyanamid and tar and the other three not manured. The manure was harrowed in and the seed sown immediately after. "The plats, especially those which had been manured, all looked exceedingly well throughout the experiment. Two cwt. of tarred cyanamid (16.7 per cent nitrogen) increased the grain yield by 1.04 cwt. and the straw yield by 4.07 cwt."

A new German phosphatic and potassic manure, C. Beger (*Fühling's Landw. Ztg., 66 (1917), No. 2, pp. 55–58; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 5, pp. 697, 698*).—Analyses of a new phosphatic potassic manure made in Germany showed it to contain 8.7 per cent total, no water-soluble, and 6.1 per cent citrate-soluble phosphoric acid; and 6.3 per cent total and 5.6 per cent water-soluble potassium.

"The author tested this manure on mustard in pots, taking into consideration only the phosphoric acid and comparing it in three different amounts (0.2 gm., 0.4 gm., and 1 gm. of P_2O_5) with manure containing all the chief food materials except phosphoric acid, basic slag, and 'Rhenaniaphosphat.' Basic slag gave the best results; next came 'Germaniaphosphat' and 'Rhenaniaphosphat,' which gave yields only equal to 38 to 74 per cent and 48 to 83 per cent, respectively, of the yield obtained by the use of slag. 'Germaniaphosphat' is, therefore, slightly superior to 'Rhenaniaphosphat.' The author considers 'Germaniaphosphat' worthy of use in agriculture, but realizes that his manuring experiments only have a limited value and should be repeated."

The substitution for Stassfurt potash salts of finely crushed Austrian phonolites, J. Stoklasa (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 45 (1916), No. 5–6, pp. 421–456; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 5, pp. 698–700; Chem. Abs., 12 (1918), No. 7, p. 735*).—Experiments are reported from which the conclusion is drawn "that potassic salts promote the growth and activity of bacteria useful to the soil. In this respect, however, phonolite is much inferior to kainit and potassium chlorid."

Bromin content of German potash salts, L. W. Winkler (*Ztschr. Angew. Chem., 30 (1917), No. 27, pp. 95, 96; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 6, pp. 841, 842*).—Data are reported showing that German potash salts contain a fairly high percentage of bromin.

New experiments on the action of sulphur on crop production, Pfeiffer (*Fühling's Landw. Ztg., 65 (1916), No. 7–8, pp. 193–207; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 1, pp. 32–34*).—Plat experiments with barley on a soil rich in organic nitrogen compounds are reported to determine the influence of sulphur when added with barnyard manure and with dried blood. The manure was used at the rate of 8 tons per acre and the sulphur at the rate of 357 lbs. per acre.

It was found that with sulphur plus barnyard manure there was a decreased yield of grain and straw as well as a decreased nitrogen content of the crop. Sulphur plus dried blood acted satisfactorily, but the excess of yield was not very great. It is concluded that the application of sulphur either with barnyard manure or dried blood produced no particular effect in the crop. The author is also of the opinion in this connection that the calculation of the probable variation is an excellent method for forming an objective opinion on the results of experiments.

Former experiments by the author on the action of sulphur have been previously noted (E. S. R., 34, p. 331).

The use of iron in agriculture, A. Monnier and L. Kuczyaski (*Arch. Sci. Phys. et Nat.* [*Geneva*], *43* (*1917*), *No. 1, pp. 66–68; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr.*, *8* (*1917*), *No. 5, pp. 693–695.*)—Experiments are reported to determine (1) the degree of solubility of the iron already in the soil, and (2) the changes undergone by ferrous and ferric compounds in arable land.

Soils of normal composition showed no trace of iron when washed with pure water or dilute solutions of alkaline carbonates and bicarbonates. A soil containing 3.2 per cent of iron and 6 per cent of lime showed traces of iron when treated with 5 per cent acetic acid. The solution by 1 per cent citric acid and tartaric acid gave distinct iron reactions, and that by 1 per cent oxalic acid gave a strong iron reaction. "One hundred gm. of soil gave 0.02 gm. of iron when treated with the citric solution, and 0.06 gm. of iron when treated with the oxalic solution.

"Certain silicious soils entirely lacking in lime, as, for example, the soil of Angers, give a fairly large proportion of iron soluble in pure water. In these soils pink hydrangeas give blue flowers; but, if a small quantity of calcium carbonate or magnesia is mixed with the soil it no longer gives up any iron and the hydrangeas do not become blue. The compounds of soluble iron are, therefore, precipitated by the lime.

"A 1/1,000 solution of ferric chlorid was filtered through a layer of soil 20 cm. thick. All the iron was retained in the upper part which turned red-brown. Calcium carbonate precipitates the iron in the form of a basic carbonate which gradually becomes a hydrate. The line of separation is clearly marked, and the filtered liquid contains no iron, but a large proportion of chlorin and calcium. This experiment was repeated with many samples of soil containing different quantities of lime. The colored layer increases in thickness in proportion as the lime content of the soil decreases. The thickness of the colored layer does not exceed 2 cm. in soil containing 5 per cent of calcium carbonate. If ferrous sulphate is used instead of ferric chlorid, the salt is oxidized and precipitated, and a mixture of basic sulphate and hydrate is formed, which colors the superficial layer red-brown, as in the case of ferric chlorid.

"The results of these experiments show that the iron contained in soils of normal composition is present in a form very difficult to assimilate, which explains the increased yield when very small amounts of soluble iron are added. The manure can have no favorable effect unless it is placed directly within reach of the roots. This condition is found in pot cultures or when the manure is added at the beginning of growth, but it is no longer present when the roots have entered the soil to a certain depth where they receive no trace of the ferric manure, which has been held up and made insoluble in the surface layers of the soil.

"Tests were also made with potassium ferrocyanid as a source of iron. The results showed that the compound is not rendered insoluble in the soil,

but that the salt undergoes a double decomposition, part of the potassium being retained by the soil. When the solution filters through the soil it turns greenish. This is due to the transformation of the ferrocyanid into ferricyanid. This oxidation appears to be due to some surface action, as it also occurs when the solution is filtered through fine sand. Experiments with potassium ferrocyanid did not give good results as, even in dilute solutions, the salt has a harmful action on vegetation."

Manurial experiments with manganese slag, M. Popp (*Fühling's Landw. Ztg., 65 (1916), No. 15–16, pp. 354–360; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 11, pp. 1600, 1601; abs. in Jour. Soc. Chem. Indus., 36 (1917), No. 16, p. 933*).—It is stated that "the manufacture of ferromanganese and spiegeleisen in Germany yields as by-product large quantities of manganese slag, of which the average composition is 24.4 per cent Mn., 30.5 per cent SiO_2, 9.8 per cent Al_2O_3, 33.4 per cent CaO, 6.3 per cent MgO, 1.2 per cent sulphur, and traces of iron. The manganese is insoluble in water but slowly soluble in weak acids.

"A series of pot experiments were carried out to compare its manurial value with that of anhydrous manganese sulphate. White Petkus oats were sown in pots each containing 10 kg. of sandy soil (with 0.28 per cent CaO, 0.14 per cent P_2O_5, 0.13 per cent K_2O, and 0.15 per cent nitrogen), which received further 1.5 gm. of potash, 1 gm. of phosphoric acid, 1.5 gm. of nitrogen, and 60 gm. of calcium carbonate in the form of marl, besides dressings ranging from 0.5 to 10 gm. of manganese either as finely powdered slag or as sulphate. The manganese slag increased the yield of both grain and straw, and the increase was greater the larger the amount applied, except for the maximum dressing (10 gm.). In small amounts (0.5 and 1 gm.) the sulphate was more effective than the slag, but with the larger dressings (2.5 and 5 gm.) the reverse was the case. With manganese slag the yield of grain was affected more than that of straw, while the sulphate affected the yield of straw most."

AGRICULTURAL BOTANY.

A textbook of botany for colleges, W. F. Ganong (*New York: The Macmillan Co., 1917, pp. XIII+604, figs. 402*).—This edition is practically the same as the volume previously noted (E. S. R., 36, p. 429), with the addition of chapters on the genetic and ecological classification of plants.

Plant physiology, V. I. Palladin, edited by B. E. Livingston (*Philadelphia: P. Blakiston's Son & Co., 1918, English ed., pp. XXV+320, figs. 173*).—This is an authorized English edition based on the German translation of the sixth Russian edition and on the seventh Russian edition published in 1914. The book is specially designed for students and is noteworthy for its brevity and conciseness. The subject matter is largely treated from the standpoint of physiological chemisty as applied to plant life, the chemical aspects of plant physiology receiving special emphasis. The editor, by means of copious notes, has added much pertinent material, thus completing the presentation of the subject. The part of the work devoted to the physiology of nutrition is much more extended than that treating of growth, configuration, and reproduction, but a classified list of books makes available references to additional information.

[Studies in plant nutrition], P. L. Gile and J. O. Carrero (*Porto Rico Sta. Rpt. 1916, pp. 13–17*).—Summary reports are given of investigations on lime-induced chlorosis, immobility of iron in the plant, the assimilation of iron by rice from certain nutrient solutions, and the absorption of nutrients as affected

by the number of roots supplied with the nutrient. More detailed accounts of these investigations have been published elsewhere (E. S. R., 36, pp. 546, 128, 431; 37, p. 222).

Biometric studies on the somatic and genetic physiology of the sugar beet, J. A. Harris (*Amer. Nat., 51 (1917), No. 608, pp. 507–512*).—This is a discussion of the recent work by investigators bearing upon the conclusions previously announced by the author with Gortner (E. S. R., 30, p. 208), regarding the correlations in the sugar beet, more particularly between the weight of the root and the sugar content of the juice.

Growth and imbitition, D. T. MacDougal and H. A. Spoehr (*Proc. Amer. Phil. Soc., 56 (1917), No. 4, pp. 289–352, figs. 13*).—The chief purpose of the studies here described was to correlate some of the more striking features of the growth in plants with the action of the factors contributory thereto, and to analyze this complex process so far as possible.

To a study of cacti, continuing that previously reported (E. S. R., 36, p. 524), was added a study chiefly of Zea and Triticum, results of which are given in detail and discussed. Experimentation with colloids, presumably comparable with protoplasm, has yielded many striking parallels with growth, making possible some new correlations in metabolism, imbibition, and growth. There has been effected, however, no simplification of the major processes of growth, the advances being rather in the opposite direction.

Newly determined features of carbohydrate metabolism have been found to be extremely complex. Imbibition in the plant is not that of a single colloid and swelling is not the simple resultant of the action of two or more substances. The interaction between two emulsoids presents many possibilities. The proteins viewed physiologically are thought to act as sensitizers to the carbohydrate gels which make up the greater part of the bulk of the protoplast, and to produce in them highly specialized effects with acids, alkalis, and neutral solutions. The general character of respiration and the nature and amount of its by-products acting upon the sensitized protoplastic gel may be taken, it is thought, to determine the general aspect, rate, course, and amount of growth in plants.

Approximation of the limits of the germination in seeds of Lepidium sativum, P. Lesage (*Rev. Gén. Bot., 29 (1917), Nos. 340, pp. 97–112; 341, pp. 137–158, fig. 1; 342, pp. 181–192*).—The author reports with discussion some tabulated results of experimentation which is still in progress on the germinability of seeds of *L. sativum* subjected for different periods of time to various media, such as alcohol, ether, salt solutions, moist air, oxygen, and water.

The physiological significance of tannin, J. Dekker (*Rec. Trav. Bot. Néerland., 14 (1917), No. 1, pp. 60, pls. 8*).—The author describes a study of the presence, location, and significance of tannin in Ribes, Rhododendron, Rosa, and Kentia. This is conceded to be inadequate as a basis for sweeping general conclusions, although these four plants agreed in showing the presence of tannin in the conducting cells of the phloëm. The agreement may be accidental or of limited significance.

A noteworthy result of this investigation is the discovery of tannin-conducting channels in the pith and in the outer cortex of the younger shoots. These are described. Differences are pointed out among the plants investigated.

Large accumulations of tannin are noted in regions in which the life processes are particularly active, as in the point of a shoot in full growth, in buds, or near regions from which a stem or root arises. In such localities also a considerable amount of calcium oxalate is often found.

On the relation of chlorin to plant growth, W. E. Tottingham (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 217–221*).—Preliminary investigations are here discussed.

The results up to this time on the different plants named leave the question regarding the influence of the chlorin ion and chlorids upon plants in a very complicated and unsatisfactory condition, apparently not admitting of any general statement. It is thought that the effect of chlorin upon any given plant depends upon the nature of the plant and the soil and climatic conditions. Progress in the interpretation of the climatic complex as a whole may be required. More complete experimental control of the very numerous conditions that make up the environment of the plant is also essential, as it is the summed or integrated effect of all of these that is registered by plants in growth and crop production.

A study of salt proportion in a nutrient solution containing chlorid, as related to the growth of young wheat plants, S. F. Trelease (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 222–225*).—In the experiments of which this is a preliminary report, the chlorin ion was added as potassium chlorid to nutrient solutions already containing all the essential elements usually absorbed by plant roots, in the form of the salts calcium nitrate, magnesium sulphate, monopotassium phosphate, and ferric phosphate. The total concentration of the solutes corresponded to an osmotic pressure of about 1.6 atmospheres at 25° C., and the relative proportions of the salts were used in all possible ways by making additions of one-tenth of this total concentration, each complete set including 84 different solutions. The data obtained are discussed in connection with the findings and views of other investigators.

It was found that with combinations of the three salts monopotassium phosphate, calcium nitrate, and magnesium sulphate, or these with potassium nitrate or with potassium chlorid, the same growth is obtained if the best proportions of the salts are used in each case. This generalization is thought to have an important bearing upon the whole problem of physiological balance in nutrient solutions, and to furnish what may prove to be important suggestions bearing on our general conceptions of conditional control and conditional optima for plant activities.

The relation of the concentration of the nutrient solution to the growth of young wheat plants in water cultures, S. F. Trelease (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 225–227*).—These experiments differed somewhat from those above noted. The salt proportions were the same in all different solutions of each series, but the solutions differed from each other in total concentration.

It is stated that transpiration and dry weight showed an approximately linear relation to the concentration of the medium above the optimum and that these decreased with an increase in concentration. The optimum concentration for dry weight of tops was altered from 1.6 to 4.5 atmospheres by changing the proportions of the four salts used in two of the series. The omission of potassium chlorid did not change the relation between growth and concentration.

The effect of renewal of culture solutions on the growth of young wheat plants in water cultures, S. F. Trelease and E. E. Free (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 227, 228*).—Reporting detailed results of experiments on the growth of wheat plantlets in the nutrient solutions found by Shive (E. S. R., 36, p. 328) to be the most suitable for the production of dry weight of tops in wheat, the author states that frequent changing of the solution increased the yield. Daily change produced marked improvement and continuous flow was even more beneficial. Marked injury was observed when the solution was changed as infrequently as every two weeks. Shaking with bone black improved the solution slightly but did not correct in any great

degree the harmful effects of infrequent changing. Magnesium injury was more marked in case of frequent changing.

Some experiences in the use of copper sulphate in the destruction of algæ, G. EMBREY (*Analyst, 42 (1917), No. 497, pp. 264–271, pl. 1*).—This is a report, with discussion, of a number of experiments following up the studies of Moore and Kellerman (E. S. R., 17, p. 12) on the effects of combined copper on algæ in reservoirs.

Chara was destroyed by a solution of 1 part copper sulphate to 3,000,000 parts water. This plant (as well as its parasites) appeared, however, on careful study, to be free from the odor ascribed to it. Further tests seemed to identify this odor as due to Tabellaria or Asterionella, or both, and to determine its character as that of a fatty oil colored with diatomin, a body closely allied to chlorophyll. The changes supposed to occur in the copper compound are briefly indicated. It is thought that oxid of copper is the real poisoning agent, and if, as is supposed, the fatty oil serves as a lubricant, the oxidation of the copper compound may be the real cause of the death of the plants.

The copper sulphate should probably be added not later than the end of April. This destroys the desmids and diatoms and prevents the formation of an organic mass into which the rootlike thallus of Chara can penetrate. This organism is almost eradicated from water subjected to this treatment.

Serodiagnostic studies on gymnosperms, R. KOKETSU (*Bot. Mag. [Tokyo], 31 (1917), No. 365, pp. 144–153*).—This is an attempt to extend the method of serodiagnostic study to gymnosperms, a number of these having been employed in this investigation. the methods and results of which are detailed. It is claimed that the indicated relationships of the plants employed agree in a general way with those already expressed in modern classification.

Studies on root nodules, K. SHIBATA and M. TAHARA (*Bot. Mag. [Tokyo], 31 (1917), No. 366, pp. 157–182, pl. 1, figs. 16*).—The authors report studies on the comparative anatomy of root nodules, classifying the plants examined so that the first type of root nodules is represented in Coriaria, the second in Myrica, the third in Gale (*Myrica gale*), and the fourth in Alnus, Elæagnus, and Ceanothus.

Variegation in Plantago, S. IKENO (*Genetics, 2 (1917), No. 4, pp. 390–416, figs. 2*).—In a study of a variegated garden race of *Plantago major asiatica* the author found this plant to breed true to type generally by self-fertilization, though this process sometimes gave a few self-colored green plants. The F_1 hybrids between variegated and ordinary self-colored green plants are self-colored green irrespective of the direction in which the cross is made. The self-colored green plant contains two factors, showing variegation only when both are absent. Each of these factors is able, independently of the other, to produce the exact intensity of green produced by both together. The F_2 plants which breed true to greenness in successive generations (constant green plants) are not always of the same genetical constitution, as has been shown by hybridization tests. Each of the few green plants produced by self-fertilization of variegated plants exhibited segregation in approximately the ratio of three green to one variegated.

Further tests are in progress regarding the genetical behavior and constitution of these plants.

Recent studies on variation in some species of micromycetes, ELISA MUTTO and G. POLLACCI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 26 (1917), I, No. 9, pp. 498–502*).—The investigations previously reported (E. S. R., 35, p. 547) have been followed by studies with cultures of *Coniothyrium tirolense* and *Phyllosticta pirina* on different media, the results of which are tabulated and contrasted.

Some unusual features of a subarctic soil, H. E. PULLING (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 188–190*).—A preliminary survey of the ecological features of subarctic forests in northern Manitoba has yielded information that emphasizes the need of including the physical root environment in an ecological study of these regions.

The soil of the spruce forest, the characteristic type of this region, is covered chiefly with sphagnum, which holds large quantities of water, except in hillside forests, in which case the soil underneath the moss, due to conditions which are explained, is usually dry and may blow as dust. Roots penetrate this dry layer only to a slight extent, although organic deposits occur as far down as the frost line. No explanation is given of the mode of origination of these deposits, nor of the fact that the soil in the dry layer is often flocculated to such a degree that it resembles a mass of small clay pellets, retaining its spherulate character even after it has been soaked with water.

The western flower guide, C. F. SAUNDERS (*Garden City, N. Y.: Doubleday, Page & Co., 1917, pp. 286, figs. 250*).—Brief nontechnical descriptions, accompanied by colored drawings, are given for the ready identification of 250 of the more common wild flowers found from the Rockies to the Pacific coast.

Flora of the Rocky Mountains and adjacent plains, P. A. RYDBERG (*New York: Author, 1917, pp. XII+1110*).—This is a manual of the flowering plants, ferns, and their allies of the Rocky Mountain region, the area covered embracing Colorado, Utah, Wyoming, Idaho, Montana, Saskatchewan, Alberta, and neighboring parts of Nebraska, South Dakota, North Dakota, and British Columbia.

Marking microscope slides, MARY K. BRYAN (*Science, n. ser., 47 (1918), No. 1207, p. 171*).—The author briefly describes the use of a carborundum pencil for the marking of microscope slides.

FIELD CROPS.

Relation of size of seed and sprout value to the yield of small grain crops, T. A. KIESSELBACH and C. A. HELM (*Nebraska Sta. Research Bul. 11 (1917), pp. 3–73, figs. 7*).—The authors report extensive investigations with wheat and oats to determine the extent to which differences in size of seed may affect the crop produced, superior yielding power having been frequently attributed to extra large seed. Sprout value is described as "the moisture-free weight of the maximum plant growth derived from the seed when planted and grown in a nonnutritive quartz medium and in absolute darkness."

The experimental work embraced the following lines of study: The relative sprout values of different grades of seed wheat, the relation of size and sprout value of seed to yield at different depths of planting, the effect of competition between plants grown from seeds markedly different in size and sprout value, the influence upon total yield of competition between large and small seeds, the effect of competition between varieties, the relation of size of seed to yield of wheat when various grades are planted alone in equal numbers, the reasons why small seeds yield less per acre than large seeds when planted in equal numbers at the normal rate for the large seed, the relative yields from large and small seeds when planted in equal numbers and at equal weights, and the relative yields of seed grades of wheat and oats as separated by the fanning mill. A historical summary of the experimental work of other investigators on the yielding qualities of large and small or light and heavy seeds is presented, including tests with winter and spring wheat, oats, barley, and rye. The loss of seed substance through respiration was determined by means of an especially

designed apparatus, and the loss not recovered in the vegetative growth or the inert seed residue partially accounted for. Considerable tabulated data are presented and fully discussed. The observations may be summarized as follows:

For all the grades of wheat seed tested in 1913 and 1914, the total sprout value of the seed averaged 54.2 per cent and 46.3 per cent of the weight of seed planted, respectively. The total loss of substance not recovered in either the sprout or the inert seed residue averaged 38.5 per cent for the two years. In all tests conducted during 1913 and 1914 the ratios for the moisture-free weight of unselected seed to the large and small seed averaged, respectively, 100:127 and 100:85, while the ratios for the total sprout value averaged 100:123 and 100:88, respectively, indicating a rather close relationship between the size of seed and its sprout value. As an average for three tests the carbon dioxid liberated from wheat seeds by respiration during fourteen days' growth in the dark in a nonnutritive medium amounted to 39.22 per cent of the original moisture-free weight of the seed, the sprout value of the same seed equaling 47.28 per cent of the original dry matter of the seed.

Very small or shrunken wheat seeds were at a marked disadvantage in comparison with large seeds, when planted at the unusual depth of 5 or 6 inches.

Separation of the mature crop of wheat, grown at the normal rate of planting, into individual plants was accompanied by an average error of 7.6 per cent, and for this reason the number of individual plants surviving from large and small seeds at harvest was not determined in these experiments. The relative production of large and small seeds of wheat was determined when planted alone and when grown in competition by alternating the seeds in rows planted at the normal field rate. The small seeds weighed 66 per cent as much as the large seeds and had a sprout value 68 per cent as large, the germinations of the two grades being practically equal. When planted alone the small seeds produced 6 per cent fewer culms, and in competition 18 per cent fewer culms than the large; the yield of grain was 11 per cent smaller when planted alone and 24 per cent smaller in competition; the yield of straw 6 per cent smaller for the small seed alone, and 25 per cent smaller in competition; and the total plant yield 7 per cent smaller for the small seed planted alone and 25 per cent smaller in competition than for the large seed.

That competition between alternating plants of two wheat varieties may be very marked was shown by Big Frame winter wheat in 1914, when grown at the normal rates of planting, the yields of grain, straw, total crop, and number of culms being respectively 90, 88, 89, and 80 per cent as large as for Turkey Red. When grown in competition, however, Big Frame yields were respectively only 55, 70, 67, and 68 per cent as large as for Turkey Red. Planted alone in 1915, the yields for Big Frame were respectively 82, 105, 99, and 94 per cent as large as for Turkey Red, and in competition were respectively 120, 128, 125, and 117 per cent as large. Similar results were obtained for spring wheat. These investigations are thought to indicate that competition may play a very important rôle in the natural improvement of cereal crops.

In a 2-year yield test of unselected, large, and small seeds of two winter wheat varieties, the average relative seed weights were 100, 134.6, and 86.9, with corresponding sprout values of 100, 133, and 92.3. The grain yield of the large seed was 2.3 per cent superior to the unselected seed and of the small seed, 3.1 per cent inferior. The 2-year average relative weights of unselected, large, and small seeds of two spring wheat varieties were respectively 100, 117.3, and 78.4, while the corresponding relative sprout values were 100, 110.4, and 71.8. The large seed outyielded the unselected for grain 11.8 per cent, while the small seed was 7.7 per cent inferior to the unselected seed. In these

tests, the seeds were planted in equal numbers at a normal rate for the large seeds.

When two grades each of spring wheat and oats were space-planted to permit maximum plant development, the small seed compared with the large produced 80 per cent as many culms per plant, 72 per cent as high grain yield, 77 per cent as high straw yield, and 77 per cent as great total yield, the small seeds averaging 52 per cent as heavy as the large. In yield tests comparing large and small seeds planted both in equal numbers and equal weights at rates normal for the large seed, (1) the small seed of winter wheat yielded 4 per cent less than the large planted in equal numbers, with equal yields when planted at equal weights; (2) the small seed of oats yielded 11 per cent less than the large when sown in equal numbers, both yielding alike with equal weights of seed; and (3) the small seed of spring wheat yielded 10 per cent less than the large seed sown in equal numbers, and only 1 per cent less when equal weights of seed were used.

During 12 years of continuous grading of Turkey Red and Big Frame winter wheat (by means of a fanning mill), the heaviest one-fourth seed averaged 0.4 bu. more, and the lightest one-fourth 0.5 bu. less than the unselected seed. For the same period the heaviest and lightest one-fourth seed of Kherson oats yielded, respectively, 0.83 bu. and 0.09 bu. more than the ungraded seed. During 8 years' continuous use of the fanning mill, the lightest one-fourth seed of American Banner oats has yielded 1.43 bu. more than the heaviest one-fourth. In a 4-year period the ungraded seed was also compared and yielded 1.6 bu. less than the light seed, while the heavy seed yielded 3.67 bu. less than the lightest seed.

Based on a review of 60 experiments by various investigators, regarding the relative yields of grades of small grain seeds, the following principles are indicated: (1) When space-planted to permit maximum development of the individual plants, a higher yield per plant is obtained from large than from small seed. (2) When planted in equal numbers at a rate optimum for large seed, a lower yield is obtained from small than from large seed. (3) When planted in equal weights, at a rate optimum for the large seed, all three grades of seed—large, small, and unselected—yield equally. (4) When distinct grades of light and heavy seeds (or small and large) are obtained from a fanning mill and planted in equal volumes slightly smaller yields are apt to result from the light seed. The difference in favor of large or heavy seed as compared with the original unselected seed is very slight and is deemed to have little practical significance, indicating that the practical use of the fanning mill consists largely in the removal of weed seeds and trash. (5) Competition between plants from large and small seeds sown in a mixture acts to increase the relative yield from the large seeds, suggesting a natural elimination (within a mass variety) of poorly adapted types which produce unduly small or light-weight seed.

The effect of weeds upon cereal crops, WINIFRED E. BRENCHLEY (*New Phytol., 16 (1917), No. 3–4, pp. 53–76; abs. in Physiol. Abs., 2 (1917), No. 6, pp. 368, 369; Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 7, pp. 984, 985*).—The author reports pot culture tests conducted at Rothamsted for the past four years with crops grown in association with weeds to determine whether vegetative competition is the sole factor suppressing the growth of crops or whether weeds excrete poisonous substances from their roots which actively inhibit growth. Wheat, barley, and buckwheat were grown alone and with *Alopecurus agrestis*, *Brassica alba*, *Papaver rhœas*, and *Spergula arvensis*, respectively. The plan of the experiments is outlined in detail, and

the results fully discussed. Tabulated data show the total dry weight of the shoots and roots of the crops and weeds, and the average dry weights of the shoots of each. In addition to the pot experiments, an attempt was made to throw some light on the question of toxicity by a series of water cultures made in 1915, in which wheat was grown alone and with *S. arvenis* and *A. agrestis*.

No evidence or indication was forthcoming to show that any toxic action was involved. It was obvious, however, that the mere competition of plant with plant, irrespective of species, had much to do with plant development, and that the time and duration of such a competitive check were the chief factors involved. Differences between pots in each set were regarded as accidental and not due to any inherent quality of the soil, as no definite correlation was observed between the 1915 crop from any one pot and the 1916 crop from the same pot. This is deemed to be further evidence of the absence of toxic substances, or at least of any toxin capable of remaining in the soil unchanged from one season to the next.

Wheat-rye hybrids, E. A. McFadden (*Jour. Heredity, 8* (*1917*), *No. 7, pp. 335, 336, fig. 1*).—The author describes a wheat-rye hybrid secured from a cross of Turkey winter wheat with Swedish rye in the summer of 1915.

The most noteworthy differences between the hybrid and its parents were the number of spikelets on the normal spike and the length of the culms. The hybrid possessed 14 or 16 pairs of spikelets per spike, with culms intermediate in length between the two parents. The plant was thrifty in appearance and produced 25 vigorous culms that developed heads and also several tillers that did not develop fully. The first spikes to appear produced no seed, due to the failure of normal pollen grains to develop. A few of the flowers on later spikes were hand-pollinated with pollen from Kharkov winter wheat, resulting in the production of three seeds, two of which produced vigorous plants in the fall of 1916, although neither survived the winter.

Assuming that hardiness is a recessive unit character, the author asserts that the hybrids could not be expected to survive a winter when nearly all unprotected wheat winterkilled. Working on this hypothesis, hybridization work along the same line was to be continued in the summer of 1917 on a larger scale, and the F_1 and F_2 plants carried through the winter in a greenhouse.

Winter forage crops, P. B. Kennedy (*California Sta. Circ. 189* (*1918*), *pp. 11*).—Brief notes are presented regarding the production and use of the following crops for winter forage in California: Field peas, common and hairy vetch, horse beans, rape, kale, giant marrow cabbbage, white mustard, root crops, bur clover, sweet clover, miscellaneous grasses, rye, and barley.

Report of the department of agriculture [of New South Wales] for the year ended June 30, 1916, G. Valder (*Rpt. Dept. Agr. N. S. Wales, 1916, pp. 25–29, 36–42, 99–102, 109, 110, 113, 114–116, pls. 4*).—Field tests at several experimental centers are reported with wheat, corn, oats, potatoes, cotton, rice, and numerous forage crops.

[Field crops work in Java], C. van Rossem (*Dept. Landb., Nijv. en Handel* [*Dutch East Indies*], *Meded. Agr. Chem. Lab., No. 15* (*1917*), *pp. 135*).—Fertilizer and cultural experiments, chiefly with rice, and studies of economic phases of agriculture on the island are reported in detail for the year 1915–16.

The production of alfalfa seed in southern Idaho, L. C. Aicher (*Idaho Sta. Bul. 101* (*1917*), *pp. 20, figs. 9*).—Approved methods of alfalfa seed production under irrigation in the Snake River Valley of southern Idaho are described, and production on dry land is briefly outlined. Alfalfa seed is said to be produced in this region at elevations ranging from 2,000 to 5,000 ft., the principal factors involved being climate, moisture, wind, and insects, especially

leaf-cutting bees. The yield of seed varies from 1 to 15 bu. per acre, experienced growers usually obtaining from 4 to 7 bu. per acre. Directions are given for harvesting and marketing the seed crop.

Barley for New York, H. H. Love and F. P. Bussell (*N. Y. State Col. Agr., Cornell Univ. Ext. Bul. 13 (1917), pp. 461–472, figs. 3*).—Variety tests with 2- and 6-rowed types of barley, begun in 1913, are reported for the 4-year period 1913–1916.

Of the 6-rowed varieties Featherston No. 7 gave the highest average yield for the 3-year period 1914–1916, amounting to 50 bu. per acre, while Manchury Selection N. D. A. C. 2125 was second with a yield of 45.4 bu. Guy Mayle was lowest with 25.3 bu. per acre. Manchury×Champion of Vermont No. 2 was best of the 2-rowed types, with an average yield of 47.1 bu., and Champion of Vermont second with 43.8 bu. per acre. Primus (Svalöf) was lowest with 29.2 bu. The average yield of the 5 best 6-rowed varieties for the 3 years 1914–1916 was 45.6 bu. per acre as compared with an average yield of 44 bu. from the best 5 2-rowed types. Commercial types deemed superior in yielding qualities include Champion of Vermont, Common Six-Row, Oderbrucker, Common Two-Row, and Silver King.

The effect of hydrogen and hydroxyl-ion concentration on the growth of barley seedlings, D. R. Hoagland (*Soil Sci., 3 (1917), No. 6, pp. 547–560*).—Having measured the hydrogen-ion concentrations of various soil suspensions representing soils of acid, alkali, and slightly alkaline types, investigations were undertaken to study the effect of similar hydrogen and hydroxyl ion concentrations in nutrient media where the numerous other variables of the soil could be eliminated.

Barley seeds were sprouted between layers of white paper toweling, and the seedlings transferred to 150-cc. bottles containing the culture media and grown for 14 days. The effect of the various solutions on the seedlings was determined from the general appearance of the roots and tops, the development of lateral roots and root hairs, and the dry weights of tops, roots, and residual seeds. In many of the experiments the fresh weight and average length of the tops were noted and microscopic examinations made of the roots. The hydroxyl-ion concentration of the solutions was controlled by varying the proportions of K_3PO_4 and K_2HPO_4, and the hydrogen-ion concentrations by the use of KH_2PO_4, supplemented in one set by 1 per cent of H_3PO_4. Neutral solutions were used as checks. The hydrogen-ion concentrations of all solutions were ascertained by electrometric measurements.

The general effect of the higher concentrations of the hydroxyl ion was to decrease the fresh and dry weights of the tops and the average length. The development of lateral roots was almost entirely repressed, while microscopic examinations of the root tips indicated unquestionable injury. The leaves also gave evidence in many cases of toxicity. Concentrations of the hydroxyl ion greater than about 1.8×10^{-6} are considered detrimental to barley seedlings, while concentrations greater than 2.5×10^{-5} are considered extremely toxic.

Acid conditions are said to be favorable to the growth of seedlings in concentrations as high as 0.7×10^{-5} hydrogen ions. The fresh and dry weight of the tops and the average length increased over that of the neutral solutions. Lateral root development was good and microscopic examinations showed no evidence of injury to the root tips. These results substantiate those obtained by Tottingham (E. S. R., 31, p. 425) as shown by electrometric measurements of solutions similar to those employed by him in studies with wheat. Decided injury, accompanied a hydrogen-ion concentration of 0.3×10^{-3}, resulting in a

large decrease in dry weight, an unhealthy appearance and lack of lateral roots, and the death of the root tips.

Seedlings were also grown in $\frac{N}{2000}$ potassium hydroxid and hydrochloric acid solutions and in a solution of acid potassium carbonate (500 parts per million). The hydrochloric acid solution proved fatal to the plants, while neither of the others caused perceptible injury. These results led to the conclusion that such dilute solutions were not capable of showing the effect of the hydroxyl ion on plant growth. The practical bearing of these studies on field conditions is briefly discussed, but no definite conclusions are reached.

Further data are presented which are held to indicate a general tendency on the part of the plant to so regulate the reaction of the media that excessive concentrations of the hydrogen or hydroxyl ion can not occur. Barley seedlings grown in potassium chlorid solutions of 500 parts per million total concentration gave no evidence of injury due to excessive hydrogen-ion concentration through the formation of hydrochloric acid as a result of the selective absorption of the potassium ion. The addition of aluminum to potassium chlorid solutions in which a number of barley seedlings were grown caused injury to the root tips and inhibited the formation of lateral roots.

Inheritance of endosperm color in maize, O. E. White (*Amer. Jour. Bot.*, *4 (1917), No. 7, pp. 396–406*).—The author reviews and briefly summarizes the work of Lock, East (E. S. R., 22, p. 627), East and Hayes (E. S. R., 25, p. 736), Burtt-Davy (E. S. R., 31, p. 331), Emerson, and Collins (E. S. R., 29, p. 34), and presents new data obtained from his own studies showing the growing complexity of facts and their interpretation in the heredity of endosperm color in maize.

California Golden Pop (Z 14) with yellow endosperm and a strain of white endosperm maize (Z 21), known as *Zea caragua* (E. S. R., 11, p. 23), were used as the parent strains, together with a white endosperm variety of Hopi maize. The F_1 progeny of Z 14×Z 21 gave uniformly white endosperm grains, while similar results were secured from a cross of Z 14 with the Hopi variety.

The F_2 progeny of Z 14×Z 21 numbered 9,663 individuals, 6,999 of which were classed as white and 2,664 as yellow. Assuming a one-factor difference between the two races, with white completely dominant or nearly so, the theoretically expected numbers would be 7,248 W : 2,416 Y. The yellow segregates presented all shades from a dark yellow (not orange) to a very light, lemon yellow on the same ear, while in some ears the yellow color was largely confined to the base of the grain.

From self-pollinated ears of the F_2 generation approximately 1,000 plants were grown, giving F_3 endosperm seed. Of these 43 ears were self-pollinated, 27 coming from F_2 seed classed as white and 16 from F_2 seed classed as yellow. Nine of the white seeds gave all white F_3 progeny, while 19 gave both white and yellow grains approximating a 3 W : 1 Y ratio. The 16 F_2 seeds classed as yellow gave 14 all yellow ears and 3 ears with both white and yellow seeds, in a 3 W : 1 Y ratio. The yellow and white endosperm color varied markedly in this generation, due to a segregation of factors affecting the texture and the degree of translucency.

Unbagged ears of Z 14 grown in close proximity to varieties with deep yellow or orange endosperm color invariably developed a larger number of dark yellow or orange grains, from which a dominance of these yellows over that of Z 14 is to be inferred, as bagged ears always gave a uniform medium yellow. Unbagged ears of Z 21 grown under similar conditions have never been known

to develop yellow grains, while cultures of Z 21 grown beside F_1 and F_2 generation hybrids (Z 14×Z 21) have always been observed to produce only white ears.

In view of these observations the author concludes that the endosperm color differences between Z 14 and Z 21 may be regarded as due to the presence and absence of a single factor A. The presence of A prevents the development of yellow color when the factors for yellow are present, and does not reveal its presence in a variety which lacks these factors. In the absence of A a given variety may be either yellow or white. Assuming a factor Y for yellow pigment to be present in both races studied, *Z. caragua* is regarded as homozygous for both A and Y, while California Golden Pop is homozygous for the presence of Y and the absence of A. It is pointed out, however, that, including the suppression factor A, at least three, and possibly five, pairs of factors are primarily responsible for endosperm color in maize.

New place effect in maize, G. N. Collins (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 5, pp. 231–243*).—The author describes experimental work with first-generation hybrids and a so-called pure strain of corn, grown in the same and in different localities as the parent stock to determine the effect upon yield of a change of place. The four varieties selected for the experiment were Stockton, Strawberry, Hickory King, and Boone. In 1912 each of these varieties was planted in rows alternating with Boone, including Boone itself, which was used as the male parent in making the hybrids, at Stockton, Kans.; Victoria, Tex.; and Lanham, Md. In 1913 the seed produced at the three localities was grown at each place, each hybrid, together with the pure-seed Boone, constituting a separate experiment involving only a comparison of the yield from the seed of the three localities. Seed of each sort from the different sources was sown in adjoining rows, and each series repeated ten times. Excessive drought destroyed the entire crop at Stockton. At the other points the corn from all the experiments was harvested on the same day, and the weight of ears and the number of plants recorded for each row. Tabulated data are presented showing the yields in pounds per row and per plant from the several rows, and the stand of plants secured from Maryland and Texas grown seed subsequently grown and compared in Maryland and Texas.

Regarding the ability to produce a stand as one of the manifestations of greater vigor, it was concluded from these preliminary results that "with all four kinds a comparison of the relative stand at the two localities is in favor of the transferred seed. In the Boone variety the transfer of seed has resulted in an 8 per cent increase of stand, a difference nearly four times the probable error. Since the analysis of the comparative stand of local and transferred seed shows that the differences are not accidental, but are consistently in favor of the transferred seed, it would seem that yield per row is a more reliable measure of comparative vigor than yield per plant. Yield per row is the measure of the practical results, and from this standpoint it is seen that all four strains showed an increase in yield as a result of transfer of seed. In Texas, where there was a definite tendency for an increased number of plants in a row to reduce the yield per plant, yield per plant is obviously ill-calculated to bring out the real difference in vigor."

To corroborate these conclusions, somewhat similiar experiments were conducted at Greenville, Tex.; Sacaton, Ariz.; and Lanham, Md., during 1915 and 1916, employing the varieties named above. The crop was a failure at Greenville. To eliminate differences due to irregularities in the stand of plants, seed from Maryland and Arizona were planted in each hill, the source of the seed being indicated by the position of the plant in the hill. Measurements were recorded of the height of each plant and the total length of the ear or ears in

hills containing plants from both Maryland and Arizona grown seed. In 1915 the crosses were made by hand instead of by detasseling alternate rows as in 1912.

In spite of all precautions a certain measure of selection was thought to prevail, but it is concluded that "the entire effect of selection would be to favor the home-grown seed, and that the transferred seed was not superior to the home grown in every instance may not be held to vitiate the cases in which significant differences in favor of the transferred seed were observed. The results indicate, however, that the stimulation is more pronounced in some stocks than in others. Thus, in the 1916 comparisons Boone×Hickory King stands out as a conspicuous exception. In all other stocks the transferred seed produced taller plants than the home-grown seed; but with Boone×Hickory King, the home-grown seed exceeded the transferred by 6.2 per cent, a difference not to be ascribed to chance, being more than eight times the probable error. Of the three stocks in which the yield was taken, Boone×Hickory King is also the only one to show superiority for the home-grown seed. Taken alone, the differences in yield could not be considered significant, but the agreement with the results for height confirms the reliability of these results."

The investigations are held to indicate the existence of a hitherto neglected factor in maize production, but much more extensive experiments are deemed necessary to determine its extent and practical importance. The experimental work reported is summarized as follows: "Hybrids between the same pairs of varieties made at different localities showed no decrease in yield as a result of transferring the first-generation seed to a new locality. On the contrary, the change of environment seemed to act as a stimulus, with the result that the yields were increased in all but one of the hybrids tested. One unhybridized variety was included in the experiment, and this also gave slightly increased yields as a result of being transferred to a new environment. In 6 of the 10 comparisons the increase is too large to be ascribed to experimental error and indicates that new-place effect should be taken into consideration as a factor of production. . . .

"There is no evidence that the importance of using acclimatized seed has been overestimated. On the contrary, the experiments show that new-place effect may often obscure the differences between acclimatized and unacclimatized seed when first compared, and thus interfere with a full appreciation of the value of adaptation. . . . The results also indicate that adaptation in maize comes about through selection rather than as a direct reaction to the environmental conditions."

Observations regarding the corn crop of 1917 (*Mo. Bul. Ohio Sta., 3 (1918), No. 1, p. 26*).—The results obtained with corn in five- and three-year rotations at Wooster (Ohio) under various fertilizer and manure treatments are briefly reviewed.

Grown continuously without fertilizer, corn yielded but 9.67 bu. per acre, while in a rotation of corn, oats, wheat, clover, and timothy it produced 30.28 bu. With applications of 12.5 and 25 tons of manure per acre in five years, corn grown continuously gave yields of 19.2 and 33.3 bu. per acre, respectively, while with an application of 16 tons in a five-year rotation it produced 75.36 bu.

Approximately 55 per cent of the Ohio corn crop is said to have fully matured in 1917, only about one-fourth being fit for seed and 39 per cent being described as soft and unmerchantable.

Selecting and testing seed corn, C. W. GOODMAN (*Texas Dept. Agr. Bul. 53 (1917), pp. 23, figs. 10*).—Detailed directions are given for the selection and testing of seed corn.

Cotton in the San Joaquin Valley, J. W. GILMORE (*California Sta. Circ. 192* (*1918*), *pp. 8*).—This circular briefly outlines the possibilities of cotton production in the region indicated, with special reference to the growing of Egyptian cotton. The soil, cultural, and moisture requirements of the crop are noted.

The adoption of a constructive policy embodying the economic features of labor, community organization and education, and the cultural features of soil preparation, planting, cultivating, irrigating, harvesting, and crop improvement is deemed essential in making the crop of permanent value to the agriculture of the State.

Cotton production in the United States: Crop of 1916 (*Bur. of the Census* [*U. S.*], *Cotton Prod. U. S., 1916, pp. 43*).—This presents tabulated statistics of the cotton ginned from the 1916 crop for the United States, for the several States, and for individual counties.

Oats investigations, T. A. KIESSELBACH and J. A. RATCLIFF (*Nebraska Sta. Bul. 160* (*1917*), *pp. 4–48, figs. 17*).—This reports on the status of oat growing in Nebraska on the basis of observations covering a long period of years, and including variety and selection tests, comparisons of irrigated and unirrigated oats for seed, a study of the effect of grading on the seed value of oats, rate-of-planting tests, notes on the relative yields of oats and other crops at Lincoln, and general observations on growing the crop and on substitute crops. Considerable tabulated data are presented and discussed.

The crop is said to be grown frequently at a loss in Nebraska, except in the northeastern part of the State. Early varieties are deemed superior to late varieties, tests covering a period of 15 years, 1902 to 1916, inclusive, showing an average yield of 54.7 bu. per acre for six early varieties as compared with 41.7 bu. for 13 late varieties. Similar tests covering a 12-year period, 1905 to 1916, showed an average yield of 58.3 bu. per acre for three early varieties and 47.2 bu. for four late varieties; while in tests covering a period of six years, 1911 to 1916, 4 early varieties showed an average yield of 56.4 bu., and 10 late varieties, a yield of 39.7 bu., there being an average difference of eight days in time of ripening for the last two periods. The best early variety was Burt, and the best late variety Swedish Select.

Forty strains of Kherson oats, originating from 750 head selections, have been grown for six years, 1911 to 1916, in the nursery, and 10 of these selections for four years, 1913 to 1916, in field plats. A white strain designated as Nebraska No. 21 is considered best, giving an average yield of 57.39 bu. per acre in the nursery and 61.9 bu. in field plats as compared with yields of 52.62 and 54.1 bu., respectively, for the original Kherson, and 64.5 and 62.3 bu. per acre, respectively, for Burt and Texas Red grown in the field during the same four-year period.

Kherson and Swedish Select unirrigated seed grown in eastern Nebraska produced an average yield for a five-year period, 1912 to 1916, of 47.6 and 33.6 bu. per acre, respectively, as compared with yields from irrigated seed grown in western Nebraska of 51 and 36.8 bu., respectively.

Fanning mill tests are noted from Research Bulletin 11, on page 732.

During five years, 1912 to 1916, large and small hand-selected seeds of Kherson oats were compared for yield when sown in equal numbers and equal weights per acre at an optimum rate for large seed. The average yield from seed planted in equal numbers amounted to 46.1 bu. for large seed and 40.9 bu. for small seed. In plantings of equal weights, a yield of 46.1 bu. was obtained from both large and small seed, and of 45.3 bu. from unselected seed.

Rate-of-planting tests extending over a period of 12 years are held to indicate that a rather wide range in rate of planting may prevail without materially affecting the yield per acre, but the data suggest a rate of from 10 to 12 pk. per

acre for varieties of the Kherson type and of 12 pk. for those of the Swedish Select type. Somewhat lower rates are deemed best for central and western Nebraska because of the less favorable moisture conditions.

Calculated in pounds per acre and allowing 30 per cent for hulls in oats, the relative grain yields of oats, corn, and winter and spring wheat for an eight-year period, 1909 to 1916, were 1,165, 2,576, 2,160, and 1,140 lbs., respectively. Assuming 30 per cent for hulls in oats and 15 per cent for hulls in barley, average yields of grain were obtained for a four-year period, 1907 to 1910, amounting to 1,147 lbs. per acre for Kherson oats, 1,750 for Oderbrucker spring barley, 1,195 for Tennessee winter barley, and 2,472 for Turkey Red winter wheat. Barley is deemed to be the best spring crop to substitute for oats.

Increased soil fertility, careful seed-bed preparation, early seeding, and treatment for smut are deemed important factors in successful oats production.

The deep-water paddy of Orissa, E. L. Rout (*Agr. Jour. Bihar and Orissa [India], 4 (1916), pp. 66–69, pl. 1; abs. in Nature [London], 99 (1917), No. 2490, p. 411*).—Eight rice varieties adapted to growth in deep water (from 6 to 12 ft.) are briefly described and illustrated.

Soy beans, N. Schmitz (*Penn. State Col. Ext. Circ. 59 (1917), pp. 16, figs. 4*).—Soy-bean growing in Pennsylvania for forage and seed production is outlined and the use of soy beans as human food briefly discussed.

Selection experiments with Deli tobacco, J. A. Honing (*Meded. Deli-Proefstat. Medan, 10 (1917), No. 5, pp. 79–128*).—Extensive selection experiments with tobacco at several experimental centers are reported in detail.

The comparative anatomy of wheat, Triticum albidum and T. erythrospermum, M. Komar (*Zhur. Opytn. Agron. (Jour. Agr. Expt.), 17 (1916), No. 5, pp. 370–399, figs. 16*).—The author arrived at the following conclusions:

In *T. erythrospermum* the size of the epidermal cells which form the chlorophyll layer and integument was greater on the ventral side than on the lateral and dorsal sides.

Although *T. albidum* is of western origin, the prolonged culture (six years) and consequent adaptation to the conditions of the region made it difficult to discern in the anatomical structure of the grain the characteristics which would indicate its origin. Consequently, differences in structure were considered due to individual peculiarities of the plants which were all produced under constant climatic and soil conditions.

Measurements of the epiderm and of the chlorophyll layer did not show any significant difference between the two wheats, but in *T. erythrospermum* the exterior integument was found to be thicker, with the pigment more intense and with the cells larger. Moreover, very large stomata were observed which may indicate to a certain degree that more intense physiological phenomena took place in the life of the plant. A possible relationship was discovered between the aleurone cells, which were larger in *T. erythrospermum*, and an increased quantity of the fats of the albuminoid bodies as shown by microchemical reactions (osmic acid, eosin, Millon's reaction, picric acid, and nitric acid).

The pigment layer in the two wheats was composed of four layers of cells, the second from the outside being wholly colored. Two layers of cells lay below this pigmented layer, but their origin has not yet been definitely established.

The improvement of wheat [in Argentina], G. O. Backhouse (*Min. Agr. Nac. [Buenos Aires], Dir. Gen. Enseñanza e Invest. Agr. [Pub.] No. 73 (1917), pp. 72, figs. 17*).—This is a general discussion of wheat improvement in Argentina through selection and variety testing in different sections of the country. A report of the work for 1915–16 is included.

Geography of wheat prices, L. B. Zapoleon (*U. S. Dept. Agr. Bul. 594* (*1918*), *pp. 46*, *figs. 9*, *maps 4*).—This bulletin presents a detailed study of the wide variations occurring in the producers' price of wheat throughout the continental United States, based on figures showing price averages by counties compiled from annual returns of some 30,000 township reporters for the five years 1910 to 1914, inclusive, and being a survey of the geography of wheat prices and price factors. The tabulated data are supplemented by maps and graphs showing geographic price zones and related factors.

The bearing of price factors on the indicated price differences is outlined in an empirical manner, these factors being described as complex, frequently interdependent, and not susceptible of absolute measurement. Price factors from 1871 to 1915 are briefly reviewed in an effort to trace present tendencies through their indicated development. In conclusion, the gross price of wheat is contrasted with the actual returns by coordinating prices, yields, and cost of production per bushel and per acre. The basic elements in geographic price differences are deemed to be population, production, demand, and indicated trade movement, the author stating that "farm prices group themselves geographically into zones responding to economic conditions attending the transit of wheat from areas of supply to those of demand."

The lowest farm price for wheat, 65 cts. per bushel, appeared in the surplus areas of Idaho and Montana, having small consuming populations and located most disadvantageously as to foreign markets. From this pivotal area, wheat prices graduated upward in every direction, following closely wheat movements toward areas of deficient production. Toward the Pacific they increased to the west and south, attaining a maximum of $1 per bushel at San Francisco and in southern California, and toward the Atlantic they increased to the east and south, with a maximum of $1.15 and over in the Southeast (chiefly in South Carolina and Georgia). Localities with higher or lower price levels than those of the surrounding territory sometimes occurred entirely subordinate to the general price current, responding to peculiarities of the commercial wheat movement.

Comparative stability and small local differences in prices were found in the great wheat-producing sections having a great volume of wheat traffic, competitive primary markets, and elaborate freight adjustments, whereas in regions having small wheat movements, greater price irregularity and higher prices obtained. A large part of the commercial wheat was found in a limited number of markets with highly organized distributive systems, each ordinarily receiving its supplies from some particular territory. "The largest single element in the regional price disparities is represented by freight rates. Though subject to change in their main features, they are constant in their influence on price conditions."

Based on summarized data showing average prices and cost of production for the period of 1911 to 1915, inclusive, it was noted that areas of high price showed minimum net returns, higher prices per bushel being offset either by high acreage costs or such relatively low yields per acre as to make the per bushel cost high. On the other hand, low prices per bushel with high yields showed high returns per acre at the lowest costs. The ratios of returns per acre or per bushel to cost, based upon average figures for the United States as 100 per cent, were 201 and 205 per cent, respectively, for Montana and Idaho, as compared with 155 and 139 per cent for South Carolina and Georgia, respectively.

In reviewing farm prices for wheat and price factors for the period of 1871 to 1915, inclusive, it was observed that the minimum farm price has moved steadily north and west, appearing in Nebraska from 1871 to 1875, in the Dakotas from 1891 to 1895, and in Idaho and Montana from 1911 to 1915.

During this period geographic differences in wheat prices, although still large, have narrowed notably, especially as between importing Eastern and exporting Western States, the diminishing price spreads being accompanied by decreasing transportation costs and the development of distributive methods, and also by a decline of wheat growing east of the Mississippi, as well as by a comparative concentration of the national wheat production within the Western North Central States.

Although wheat production in the United States practically trebled during the period of 1871 to 1915, in proportion to population it has remained stationary since 1882 to 1886, with 8.2 bu. per capita as against 8.3 bu. in 1911 to 1915. A notable and general decline was also observed in the proportion of wheat to total improved land within the wheat belt, showing that increased production was chiefly due to new areas brought under cultivation, together with some slight increase in the yield per acre. Wheat production east of the Mississippi dropped from 62.2 per cent of the total to 26.2 per cent, while that of the Western North Central States (including Minnesota, Iowa, Missouri, North and South Dakota, Nebraska, and Kansas) increased from 26.1 per cent to 51.8 per cent. It was only in the Mountain States (Montana, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, and Idaho), however, that any considerable recent growth in the ratio of wheat production to population was observed, due largely to new areas brought under cultivation, the per capita production in this region increasing from 0.8 bu. during the period 1871 to 1875 to 20.3 bu. in 1911 to 1915.

Seed Reporter (*U. S. Dept. Agr., Seed Rptr., 1 (1918), No. 4, pp. 4*).—Tabulated statistics are presented on seed stocks of cowpeas, soy beans, lespedeza, Sudan grass, sweet and grain sorghums, and millets based upon reports made December 31, 1917, by shippers; on forage plant seed permitted entry into the United States during January, 1918; and on a comparison of retail prices of vegetable seeds for 1918 with those for 1917 compiled from a large number of retail mail-order catalogues received from representative seedsmen.

Information relative to the clover-seed situation is presented, and jobbers' prices for country-run seed, and quotations on recleaned seed, are briefly noted for millet, forage and grain sorghums, Sudan grass, alfalfa, sweet clover, and corn in the Missouri Valley.

The seed spring wheat situation in Minnesota, the Dakotas, and Montana is reported as generally favorable, and the quality of the seed as excellent.

Noxious weeds in New Zealand, A. H. Cockayne (*Jour. Agr. [New Zeal.], 14 (1917), No. 5, pp. 339–344*).—From 669 replies to inquiries sent out to farmers by the New Zealand Department of Agriculture relative to the most serious weeds of arable and pastoral land, a tabulated statement is presented showing the 15 principal weeds reported for North Island and the same number for South Island. Ten weeds of the latter group are weeds of arable land as compared with only two of the former group, due to the difference in farm practice in the two localities. The State is divided into weed districts, giving the three principal weeds for each.

HORTICULTURE.

Relation of the variability of yields of fruit trees to the accuracy of field trials, L. D. Batchelor and H. S. Reed (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 5, pp. 245–283, figs. 5*).—In this paper the authors present the results of a study at the California Citrus Substation of the nature and extent of the casual variability of yields of fruit trees under field conditions and its bearing on the reliability of plat trials. The results of previous studies relat-

ing to the varying productivity of fruit trees, together with studies dealing with errors in field trials, are reviewed, and a bibliography of cited literature is appended.

The results of this investigation, which are presented in a series of tables and fully discussed, are summarized as follows: "Studies have been made upon the variability of the yields of orange, lemon, apple, and walnut trees. The orchards studied were selected on account of uniformity of treatment and appearance, yet the variability in productivity was considerable. The coefficient of variability for the yield of individual trees of the clonal varieties ranged from 29.27 ± 0.69 to 41.23 ± 1.52 per cent, but for the individual seedling walnuts the coefficient was somewhat higher, reaching 53.91 ± 1.92 per cent. The variability of these tree yields approaches the normal curve of errors. This variability may be assumed to be the result of 'casual' factors which are beyond the control and possibly the recognition of a careful experimenter.

"The effect upon variability of combining trees into plats of various sizes and shapes has been investigated. As the number of trees per plat is increased, the coefficient of variability decreases. The coefficient of variability does not decrease, however, in proportion to the increased number of trees per plat. In most cases there is little gained in accuracy by increasing the plat to include more than eight adjacent trees.

"One of the great causes of variability in yields appears to be the heterogeneity of apparently uniform soil. While a combination of a sufficient number of adjacent trees into a plat will overcome largely the fluctuations of individuals, nevertheless the plats may not sufficiently include both high and low yielding areas to give a typical average. Greater reliability may be secured by a systematic repetition and distribution of plats through the experimental area. A consistent gain in reliability resulting from this method of repetition is shown by the use of several different methods of computing the variability.

"The coefficient of variability for an average plat of 16 adjacent trees was 22.58 ± 1.01, while 16 trees in 4 scattered ultimate plats each of 4 trees have a coefficient of variability of 9.29 ± 0.4. The larger the number of units in a combination plat the more typical is the sample of the area obtained. A 16-tree plat can be expected to give more reliable results if divided into four equal plats and repeated at four regularly placed intervals than can either two 8-tree plats, or 16 adjacent trees. The same principle holds true for larger units. A given number of unit plats will give a greater accuracy than half the number of units with twice as many trees per unit.

"Four repetitions of an ultimate plat reduced the coefficient of variability to a point considered practical for cultural operations. Further repetitions, though reducing the coefficient in less degree, did not appear to justify the additional number of trees required. A minimum of 8 to 10 trees is required for plats involving cultural experiments. In case of rootstock, pruning, or variety trials, twice as many plats each containing half as many trees might be used to obtain greater accuracy.

"The fact that marked soil variations occur which tend to make adjacent trees or adjacent plats yield alike, even on soils which were chosen because of their apparent uniformity, is well shown by applying the formula proposed by Harris [E. S. R., 33, p. 727] for measuring the coefficient of correlation between neighboring plats of the field. Applying this to the Arlington navel oranges, the writers have calculated the correlation between the yield of the 8-tree plat as the ultimate unit and the yield of the combination of four such adjacent plats, and it was found that

$$r=+0.533\pm0.085.$$

"This result shows a marked correlation, indicating a pronounced heterogeneity in the soil of this grove influencing fruit production. However, when the correlaton between the 8-tree plat as the ultimate unit and the yield of the combination of four such systematically scattered plats was calculated it was found that

$$r = +0.137 \pm 0.120.$$

"This coefficient is practically equal to its probable error and can be regarded as significantly zero.

"In the computations made by the writers emphasis is also laid upon the nature and magnitude of the probable error. It is shown in several cases that the probable error of comparison between plats may be so large that relatively large differences must be evident between treated and untreated plats for a reasonable assurance that it is due to the factors being experimented upon. With the plats of 16 to 32 adjacent trees which were studied, a difference of from 62.94 to 81.97 per cent of the mean production would be necessary in order to obtain chances of 10 to 1 that the results were due to differential treatment and not to casual variation in the productivity of the trees. With the same number of trees in scattered units, a difference of 28.42 to 50.02 per cent would be necessary for the same odds. It seems probable, therefore, that a difference between two tree plats of less than 50 per cent of the mean production should be considered with caution before attributing it to differential treatment.

"The relation between the shape of a plat and its variability was investigated by making comparisons between square plats and linear plats containing the same number of trees. Except in the case of large plats, the difference in the variability of plats of different shapes was insignificant.

"In any method of field experimentation where a standard of comparison is desired the theoretical or 'normal' yield of a plat is a question of importance. By the use of certain formulas the 'normal' yield may be computed from control plats. As a standard, one may use the average yields of the control plats of the entire area, or of the nearest control plats, or a combination of the two. In cases studied, the coefficient of variability was reduced 50 per cent by calculating the normal yield from the nearest controls in place of using the mean of the entire area. The employment of every alternate row as a control plat was not sufficient to offset the variability due to soil heterogeneity.

"Computations made on the yields of orange, walnut, and apple trees for several consecutive years showed little annual fluctuation in their variability. One or two crops may not show greater variability than the average of six or seven crops."

Factors influencing the abscission of flowers and partially developed fruits of the apple (Pyrus malus), A. J. Heinicke (*New York Cornell Sta. Bul. 393* (*1917*), *pp. 45–114*, *figs. 8*).—This bulletin contains the results of observations and experiments made during the three seasons 1914–1916 with the view of determining the factors influencing the abscission of flowers and of partially developed fruits of the apple during the so-called June drop. The literature of the subject is briefly surveyed and a bibliography is appended. A popular summary of the work had been previously noted (E. S. R., 38, p. 541).

The data collected during the course of the study and here recorded show the percentage of flowers developing fruits and of flower spurs retaining fruits after the first drop and after the June drop; the relation between amount of bloom and set of fruit; set of fruit on limbs with large leaves and on limbs with small leaves; set of fruit as influenced by the location of the spur on the twig growth of different years; set of fruit on spurs formed on different parts of a given year's growth; relation between the number of flowers to the spur

and ability of the spur to set fruit; relation between length of spur growth made during the preceding season and fruitfulness of the spur; relation between weight of flower-bearing spur and its fruitfulness; relation between weight of spur to the number of flowers and to the length of the previous season's growth; relation between the weight of the new spur growth and the diameter of the conducting tissue; relation between diameter of conducting tissue and weight of spurs, from limbs having a light bloom and from those having a full bloom; relation between water supply, leaf area, and pushing of buds; relation between amount of lateral growth from the flower-bearing spur and fruitfulness of the spur; relation between sap supply and fruit setting; fruit setting as influenced by varying amounts of leaf surface on the flower-bearing spur; influence of sunlight on the setting of fruit; relation between seed formation and fruit development; observations concerning some of the physiological effects of seeds; relations to be considered in choosing fruits borne under similar conditions; and experiments concerning the formation of the absciss layer, showing the effect of removing fruit and leaving varying lengths of stem, effect of coating fruit with vaseline to inhibit transpiration and exchange of gases, effect of slow and rapid drying of leaves on detached spurs with uncoated fruit and on detached spurs with vaseline-coated fruit, and the effect of a saturated and of a dry atmosphere on abscission of fruit on detached spurs.

The author found that from two-fifths to four-fifths of the total number of flowers are lost during the early drop, or within from one to four weeks after the petals fall, only 3 to 7 per cent of the total number of flowers finally develop into fruits, and from one-sixth to one-third of the flower-bearing spurs finally set fruit. The proportion of spurs that set fruit after the first drop and that hold fruit after the June drop varies with the variety, with individual trees of the same variety and on different limbs of the same tree.

Summing up the evidence as a whole, the author concludes that "the results presented . . . emphasize the importance of vigor, more especially the vigor of the individual spur, as a factor in fruit setting. As compared to weak spurs, the previous season's growth of vigorous spurs is longer, the new spur growth is heavier, the leaves are larger and more numerous, there are more flowers to the spur, the diameter of the conducting tissue is greater, and the weight of the lateral spur growth is greater.

"The vigorous spurs seem to favor fruit setting because they can supply the developing fruits with an abundance of water and food. Seeds appear to be valuable because they supplement the forces that bring sap to the fruit. Strong seeds are of primary importance for the setting of fruit on relatively weak spurs; they are of lesser importance for the setting of fruit on strong spurs.

"The number of strong seeds is dependent on effective fertilization, which in turn presupposes cross-pollination. Even though the grower may plant several varieties of the same fruit which bloom during the same time, nevertheless cross-pollination is frequently prevented by unfavorable weather during blooming time. Man has little control over the weather. On the other hand, man may influence the vigor of the tree by cultural methods. Trees in sod, for example, are usually less vigorous than trees in a tilled orchard. The latter, as a rule, produce heavier crops of fruit. . . .

"The application of a quick-acting nitrogenous fertilizer, such as sodium nitrate, early in spring may have a decided effect in stimulating early and rapid spur growth that would be likely to set fruit the following year. Some evidence for this suggestion is contained in the paper by Lewis and Allen [E. S. R., 35, p. 540] received by the writer while the present report was in the course of preparation. . . .

"The observations and experiments recorded . . . justify the tentative conclusion that unfavorable conditions of nutrition and water supply are among the basic factors which cause the normal drop of flowers and partially developed fruits of the apple. All factors that have a direct or an indirect influence on nutrition and water supply of the flower and the fruit, such as pollination, weather, cultivation, and the like, are of importance. Fruit development, however, is possible without cross-pollination and even under relatively unfavorable weather conditions, so long as the young fruit has an abundant supply of water and of readily available food."

The common honeybee as an agent in prune pollination, A. H. HENDRICKSON (*California Sta. Bul. 291* (*1918*), *pp. 215–236, figs. 13*).—In some tent experiments conducted in 1916 (E. S. R., 36, p. 536) it was shown that bees are a necessary aid to pollination with the French and Imperial varieties of prunes. The study was continued on a larger scale in 1917 and is here reported on in detail. The tent experiments were so arranged as to test the effect of the absence of pollen-carrying agents, to study the question of interfertility or the necessity for interplanting for purposes of cross-pollination between the two varieties, and to determine the ability of each variety to set fruit with its own pollen. Counts were also made of the blossoms of each variety on trees growing in the open, in order to get the set of fruit that occurred under average orchard conditions.

Summing up the results of the two seasons' work, the author concludes that "both the French and Imperial prunes may be aided in setting fruit by the use of bees in the orchard during the blossoming period, provided the trees are in a normal, healthy condition. The absence of bees in the orchard may mean a low percentage of set with both of these varieties. The French prune does not absolutely require interplanting with the Imperial, even though this arrangement may prove beneficial to both varieties."

Pruning the seedless grapes, F. T. BIOLETTI (*California Sta. Circ. 191* (*1918*), *pp. 12, figs. 10*).—This circular contains specific directions for the methods of pruning which have given the best results with seedless raisin grapes. Information is given relative to the treatment of young vines, trellising, and pruning bearing vines.

The mango in Porto Rico, C. F. KINMAN (*Porto Rico Sta. Bul. 24* (*1918*), *pp. 30, pls. 11*).—This bulletin embodies the more important results relative to mango culture in Porto Rico, based upon several years' work at the station during which trees of many varieties have been imported, propagated, and in some cases brought into satisfactory production. The important phases discussed include the soil and climate of Porto Rico, with special reference to mango growing, blossoming period, propagation, importance of classification, description of varieties, weights of different parts of fruits, protection against fruit flies, harvesting and packing, and mangoes as ornamentals.

The investigation as a whole has shown that imported varieties of mangoes superior to the common mango of Porto Rico can be grown successfully in practically all Porto Rican soils, provided that there is a good subdrainage and that they should be planted extensively for market and home use. Good crops are more certain along the western and northern lowlands of the island where the rainfall is light during the blossoming season. The prevailing winds and morning sun seem to be very beneficial both for the growth of the trees and setting of fruit; hence open, exposed sites should be selected for the orchard. Propagation both by inarching and by bark grafting has proved satisfactory for use in the nursery and for top working large trees. Large seeds which produce only one plant are most satisfactory for stocks. The East Indian varieties produce larger and more thrifty plants as a rule than the native mangoes. Both

nursery and other mango trees may be transplanted successfully if they are not making a new growth and rainfall is plentiful.

The confusion in the classification of types of mangoes as well as the great variation in growth and productiveness of the trees and quality of fruit seriously handicap the present development of mango orchards in Porto Rico. Of the imported varieties that have fruited, the most productive of the thrifty kinds with fruits of high quality are Cambodiana, Totafari, Amini, Bennett, and Paheri. Of these, Cambodiana and Paheri appear to be better suited to home than to commercial use. Fruits of the native varieties and all varieties from Martinique, Trinidad, and South America are less desirable than many of the other imported kinds.

The station's work has shown that mangoes that have not softened on the tree should be picked with a stem longer than the fruit stalk so as to prevent the juice of the base of the fruit from escaping through the fruit stalk and leaving passages for the entrance of infection. Fruits in orange wrapping paper did not ripen or decay so quickly as those wrapped in oil paper, newspaper, or coconut fiber, or those left in the open air. Fruits packed in coconut fiber ripened earliest. East Indian varieties showed much better keeping qualities than the native varieties.

The author points out that the mango is one of the most satisfactory ornamental trees for Porto Rico and that it is possible to select from varieties producing fruit of high quality those which best carry out a particular scheme of landscape gardening.

Report of the horticulturist, C. F. KINMAN (*Porto Rico Sta. Rpt. 1916, pp. 17–21, pls. 2*).—A progress report on investigations with pineapples, coconuts, and mangoes, including notes on some miscellaneous introductions. The work with mangoes is reported on in a bulletin on page 747.

During the past two years the work with pineapples has included a comparison of the effects of nitrate of soda and sulphate of ammonia in a complete fertilizer. The results of these tests indicate not only that sulphate of ammonia is the most desirable source of nitrogen for pineapples in soils similar to that at the station, but that nitrate of soda should not be used for fertilizing pineapples in this soil type and that experiments should be conducted to determine its value in other soil types before it is used commercially. The plants receiving their nitrogen from sulphate of ammonia continued their vigorous growth and maintained their healthy color throughout the year, whereas those on the other plats, including the plats receiving nitrogen from nitrate of soda, made a very slow growth and remained abnormal in color.

In the fertilizer experiments with coconuts the plats receiving a complete fertilizer continue to produce much larger crops than those given an incomplete mixture, whereas in the group of plats where either nitrogen, phosphate, or potash is omitted from the fertilizer the yield is little heavier than that of the check plat. Complete fertilization has gradually increased the number of nuts harvested, but the average diameter of the nuts has remained practically the same throughout all plats in the experiment. Measurements made of the husks and nuts from a number of selected trees for several years have shown that the product from a given tree varies little in size and proportion of husk and nut from harvest to harvest. A study is being made of the progeny of seed from selected trees.

Twenty varieties of American-grown sweet potatoes, which were sent to the station by the Bureau of Plant Industry of the U. S. Department of Agriculture in 1911 and grown at the station, have all lost their characteristic flavor and at least some of them have developed a coarseness not common on the mainland. These importations are not in general superior in flavor or texture to the types

which have been grown in Porto Rico over a long period of years. A comparative test of a new stock of these varieties is to be made. Among the native sweet potatoes one with superior qualities, known locally as mamey, is being propagated for distribution.

Two types of the leguminous plant *Phaseolus mungo* received from the Philippine Islands have proved very thrifty and prolific at the station when planted during the spring, although poor crops have resulted from summer, fall, and winter plantings. The cooked seed of this plant is palatable as food and its heavy foliage makes it valuable as a soil improver or cover crop.

A variety of banana known as Hua Moa received by the station from Hawaii several years ago is giving some promise as a cooking banana, although it does not appear to thrive well except when given good applications of stable manure.

Report of the assistant horticulturist, T. B. McClelland (*Porto Rico Sta. Rpt. 1916, pp. 21–24*).—The testing of coffee varieties new to Porto Rico was continued and promising varieties are being distributed widely. Observations on an extensive planting of Robusta coffee indicate that it is inferior in quality to that of the Arabian type grown in Porto Rico, but its heavier yield makes it a promising crop for supplying a low-priced market. This coffee matures later than the native coffee, the main crop ripening in late winter and early spring rather than in autumn. This is suggested as being an advantage as it furnishes employment to pickers in a dull season. The rank growth of the trees necessitates topping to 7 or 8 ft. to facilitate picking. The coffee locally known as "Murta" has proved to be a mongrel and inheritance of different forms is being studied. The experimental transplanting of coffee trees continues to show wide differences both in growth and yield as the result of the method followed. This work is discussed in detail in a separate report (E. S. R., 37, p. 649). Fertilizer experiments with coffee continue to show beneficial effects, both on growth and crop, from the application of nitrogen. A native tree of dwarf growth (*Erythrina corallodendron*), not hitherto used locally as coffee shade, is being tested for this purpose. Plantings without shade of different coffee varieties are also being made to compare their relative vigor in the open.

Records have been kept of the number of pods produced on individual cacao trees for several years. Of plantings made in the spring of 1909 a little more than one-fourth of the trees produced no crop in the calendar year 1915. The others averaged nearly 10 pods per tree. In plantings made in 1903 about the same proportion of trees failed to produce but the average yield from the fruiting trees was 6.5 pods per tree. Attempts to propagate cacao from cuttings have been unsuccessful.

The experiments thus far conducted with vanilla show this to be a promising crop for Porto Rico. It requires careful attention and a great deal of labor, but with proper conditions large returns may be secured from a small acreage. In crossing vanilla species some very marked modifications, here noted, in the shape of the resulting pod have followed the application of foreign pollen. A new planting of vanilla has been made for further tests of the effects of light and dense shading, different pruning systems, the removal of superfluous blossoms, and the pollination of few to many blossoms per cluster.

Trees of mahogany (*Swietenia macrophylla*) continue to show adaptability to local conditions. In a planting made at the station the average height at 3 years from seeding was 16 ft., the maximum height 30 ft.

Bush beans in the greenhouse, S. N. Green (*Mo. Bul. Ohio Sta., 3 (1918), No. 1, pp. 16–20, figs. 2*).—Experiments on the greenhouse culture of bush beans conducted during the three seasons 1915–1917 are reported.

Of twelve varieties tested, the variety Plentiful gave the highest average yield of 6.4 oz. of green beans per hill for the three seasons, followed by Canadian Wonder with 5.9 oz. and Sunrise with 5.1 oz. per hill. The author points out that at present most of the varieties suited to greenhouse culture are of English origin, and that suitable varieties must be bred in America before the fullest returns can be expected from this crop.

In these experiments, the beans were planted in March and April. The average variety matured the crop in 70 days. There was no great difference between the yield of beans planted in hills and those planted in rows. Hills planted 12 by 18 in. apart with 2 plants per hill gave better average results than hills spaced 12 by 12 in. with either 2 or 4 plants per hill. With rows planted 16 in. apart, a 1-in. space between the beans gave somewhat better results than a 2-in. space. It is pointed out that planting distances must be determined for specific soil and other conditions.

A test of various soils indicated that nearly all greenhouse soils are suitable for forcing beans without more attention than is given tomato and cucumber soils, but that the bean crop should be watered more sparingly than the tomato or cucumber crop in order to keep the soil in good physical condition and to prevent the rapid spread of fungus diseases. An excess of water may also interfere with proper pollination of the flowers. Methods of controlling insects and diseases are briefly discussed.

Heredity studies in the morning-glory (Ipomœa purpurea), E. E. BARKER (*New York Cornell Sta. Bul. 392* (*1917*), *pp. 5–38, pls. 3*).—This bulletin presents the results of experiments with morning-glory plants which were studied in pedigree cultures. Germinal analyses of them were made by means of crossing and subsequent selfing, supplemented by collateral breeding tests from the parents used in the crosses. The data secured are presented in a series of tables and fully discussed. A bibliography of cited literature is given.

The important results and deductions from the study are summarized as follows: "Several characters were studied which in heredity behaved in an alternative and Mendelian manner. These were color of the seed coat, feathering of the corolla, color of the corolla, and flaking of the corolla.

"The seed coat is either black or yellowish brown (tan). Black is the dominant color. Black, being the dominant color in the maternal somatic tissues, may lend character to the seed coat without giving any indication whatever of the nature of the embryo within it. A black seed coat may contain a homozygous or a heterozygous black embryo, or a homozygous tan embryo. A tan seed coat may contain a heterozygous black embryo, but never a homozygous black embryo. It may contain a homozygous tan embryo.

"Feathering of the corolla is a Mendelian character dominant over its absence. The color of the corolla differed in the several types in the series here studied. The types were progressively epistatic one to another from white through pink, magenta, and blue to dark purple.

"Anthocyanic colors are due to the action of enzyms upon colorless chromogens, producing thereby colored pigments. The color types studied in the morning-glory were in complete accord with the enzym theory. Each epistatic type is due to the addition of one or more genes probably enzymatic in nature which are not present in the hypostatic type. Flaking is a dominant character in the morning-glory material here studied. It is explained by a hypothesis supposing the character to be due to an enzym which is locally distributed in the corolla and which reacts with a colorless chromogen to produce the colored flakes. Where it is present without the gene for producing solid color, flaked whites result; when present together with this gene, flaked solids are produced."

FORESTRY.

A manual for northern woodsmen, A. CARY (*Cambridge: Harvard Univ. Press, 1918, rev. ed., pp. XIV+302, pls. 3, figs. 87*).—The present edition of this manual (E. S. R., 21, p. 241) has been brought up to date as concerns appliances and methods, and new matter and tables have been introduced that are mainly intended for the benefit of western woodsmen.

Annual progress report upon State forest administration in South Australia for the year 1916–17, W. GILL (*Ann. Rpt. State Forest Admin. So. Aust., 1916–17, pp. 12, pls. 6*).—A statistical review relative to the administration and management of the State forests of South Australia, including data on alterations in forest areas, planting and other forest operations, revenues, expenditures, etc.

A few notes on bamboos (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 3 (1917), pp. 85–87*).—Brief notes on the propagation of bamboos including descriptions of the most common species in Assam.

Incense cedar, J. A. MITCHELL (*U. S. Dept. Agr. Bul. 604 (1918), pp. 40, pls. 6, figs. 3*).—An account of the incense cedar (*Libocedrus decurrens*) of the Pacific Coast States, with reference to its commercial importance, products and uses, available supply, characteristics of the wood and tree, reproduction, range, silvical requirements, growth, stand per acre, enemies, management, and artificial forestation. Volume tables in cubic and board feet based on measurements in several National forests in California are appended.

Note on kokan or lampatia timber (Duabanga sonneratioides), R. S. PEARSON (*[Indian] Forest Bul. 36 (1917), pp. 8, pl. 1*).—This note deals with the general distribution, locality, and habit of kokan (*D. sonneratioides*) timber, together with its natural reproduction, rate of growth, distinguishing characteristics of the tree and timber, properties and uses of the timber, method of extraction, yields, and prices. The note is accompanied by an actual specimen of the wood.

Note on the contraction and warping which takes place in Pinus longifolia timber while seasoning, R. S. PEARSON (*[Indian] Forest Bul. 37 (1917), pp. 6, pls. 5*).—This note describes experiments undertaken to ascertain the amount of warp which takes place in *P. longifolia* timber when seasoned by different methods, and also an experimental test of the amount of contraction across the grain which takes place as the timber passes from a green to an air-dry state.

Comparative yearly volume increments of certain Indian tree crops. R. E. MARSDEN (*Indian Forester, 44 (1918), No. 1, pp. 10–16*).—Tabular data are given showing the comparative yearly volume increments of several Indian tree crops.

Imports of timber into British India during the years 1912–13 to 1916–17 (*Indian Forester, 44 (1918), No. 1, pp. 20–22*).—A comparative statement of imports of timber into India and Burma by sea from foreign countries during the last five years.

Lumber used in the manufacture of wooden products, J. C. NELLIS (*U. S. Dept. Agr. Bul. 605 (1918), pp. 17, figs. 2*).—This report presents statistics showing the average annual consumption of wood by the wood-working industries in the United States. The basic data were secured by a series of State wood-using industry studies. Those for the more important States have been published separately and have been noted in the Record from time to time. Although the State studies were begun in 1909 and were not completed until 1913, a period of 12 months was made the basis for the statistics for each State, and the final figures for the whole country here presented are considered

a very good average of the demand of each industry and the demand for each kind of wood. All imported woods used by factories are included in the statistics.

DISEASES OF PLANTS.

Embryomas in plants (produced by bacterial inoculations), E. F. SMITH (*Bul. Johns Hopkins Hosp., 28 (1917), No. 319, pp. 277–294, pls. 28, fig. 1*).—Having continued to experiment since reporting previously on the relation of crown gall of plants to human cancer (E. S. R., 35, p. 545), the author offers further data on the production by bacterial inoculation of anomalous crown galls, which are considered as atypical teratoid tumors.

Such (embryonal) tumors have now been produced by the author on plants of 16 genera in 15 families. All that is necessary is to introduce the crown gall bacteria into the growing tissues of susceptible species in the vicinity of totipotent cells, which may be either dormant axillary buds or meristematic cells, remote from leaf axils and buds or bud anlage, these cells having the potentiality of germ cells whether they be somatic or germinal as regards origin. The principal genera used for the work here reported were Nicotiana and Pelargonium.

The present paper reports the result of efforts to produce hyperplasias in the middle of internodes remote from the usual points of origin of buds and shoots; to determine under what conditions tumors can be made to grow as ordinary sarcomata destitue of teratoid elements or to produce roots, leafy shoots, floral abortions, and mixtures of these; to determine what particular tissues may give rise to teratoids, and what can produce only sarcomata; to record photographically the inception, progress, and rapid proliferation and decay of these tumors; to demonstrate by photomicrographs the embryonic and fragmentary nature of deep-lying teratoid elements; and to show the existence of jumbled sarcomatous elements in their vicinity. Records were also obtained on fasciation and related abnormalities; on variation in the rate of tumor growth; on secondary infections; on the failure of tumors, after once starting, to continue to grow; and on the germicidal effect of collodion used to cover the wounded surface after bacterial inoculation.

The British species of Phomopsis, W. B. GROVE (*Roy. Bot. Gard. Kew. Bul. Misc. Inform., No. 2 (1917), pp. 49–73, pls. 2*).—The two features considered most distinctive of the genus Phomopsis are the permanent sporophores and the nature of the pycnidium, the latter bearing little resemblance to that of a typical Phoma. The four chief accounts given of the genus by other authors since Saccardo are noted. The British list, which is more or less descriptive, includes 76 species. This is followed by a list of 21 species found elsewhere, and this by a discussion in this relation of *Phoma asparagi* and *Cytospora stictostoma*. A list of host plants is also given.

[Cotton rust investigations in Texas], E. W. OLIVE (*Brooklyn Bot. Gard. Rec., 6 (1917), No. 4, pp. 154–158*).—The author investigated a sudden outbreak of cotton rust which was violent during May and June, 1917, in southern Texas, having spread supposedly from Mexico. The effects as noted some time after the violence of the attack had passed are briefly described. The crops in the area affected suffered a loss of probably from 20 to 70 per cent. Several rusted grasses were collected for examination, as the rust is thought to utilize some wild plant or plants as alternate hosts.

It is considered probable that the rust in question occurs sporadically every season, perhaps in many localities. The restricted area affected suggests that the infection of the grass host which is supposed to carry the alternate stage

must have been limited or else that the weather conditions in this vicinity were specially favorable this year. A similar rust is said to have appeared previously in California, Lower California, Mexico, Falfurrias, Tex., and Miami, Fla.

Peronospora on hemp, V. PEGLION (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 26 (1917), I, No. 11, pp. 618–620*).—The author reports having noted the presence of oospores in various cultures of a fungus on hemp which has been referred to Peronospora. On the basis of studies of this and related forms he holds that this organism should be referred to the subgenus Peronoplasmopara proposed by Clinton (E. S. R., 17, p. 156).

Conditions influencing the distribution of potato blight in India, J. F. DASTUR (*Agr. Jour. India, Indian Sci. Cong. No., 1917, pp. 90–96*).—The author discusses further (E. S. R., 35, p. 150) the history of potato late blight (*Phytophthora infestans*) in various parts of the world as evidencing its inabilty to exist continuously at points having prolonged periods of temperature much above 77° F. He states that on the plains of India the fungus is normally unable to survive in soil or tubers, so that potatoes ordinarily susceptible to this disease may be grown if they are imported in summer when the temperature is sufficiently high to kill the fungus.

A potato parasite new to Italy, B. PEYRONEL (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 26 (1917), I, No. 9, pp. 509–512*).—In the course of work with potatoes supposed to be completely sterilized in preparation for other work, a fungus appeared on the surface of the tubers which was found to be *Spondylocladium atrovirens* and which is briefly discussed. Since that time the author has seen this fungus in potato tubers produced elsewhere in Italy.

Irrigation experiments on apple spot diseases, C. BROOKS and D. F. FISHER (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 3, pp. 109–138, pls. 4, figs. 10*).—This paper deals with the effect of soil water supply upon bitter pit, Jonathan spot, and certain other nonparasitic spot diseases of the apple. It also includes notes upon the relation of the time of picking to the development of apple spots in storage. The experimental work on this investigation was carried on in the State of Washington.

It is claimed that bitter pit and Jonathan spot are readily distinguished from rosy-aphis stigmonose, drought spot, cork, and blister, bitter pit usually appearing first as spots of dead brown tissue in the subepidermal tissue of the apple. These spots are associated with the terminal branches of the vascular bundles, and in the later stages of the disease the browning often follows the vascular bundles deep into the flesh of the apple. Rosy-aphis stigmonose is said to be characterized by similar brown spots, the affected tissue being firmer than in the case of bitter pit and there being no association with the vascular bundles. The early stages of Jonathan spot are said to be confined to the color-bearing cells of the skin of the apple. Drought spot is characterized by the checking of the growth at certain points on the apple without the production of any large quantity of corky tissue. Cork differs from drought spot in the presence of comparatively large areas of corky brown tissue and in the fact that these areas are usually rather deeply seated in the flesh of the apple. Blister is the name given to superficial lesions associated with cork and characterized by a blister-like appearance.

Drought spot is said to be produced by sudden and extreme drought. Cork is apparently a drought effect, but it differs from drought spot in that its occurrence is usually associated with certain peculiar soil types.

Experiments have shown that there is a close relationship between the soil water supply of the orchard and the development of bitter pit in storage, heavy irrigation greatly increasing the disease, light irrigation reducing it. The lowest percentage of bitter pit was found on apples which received a heavy irrigation followed by a light one. Heavy irrigation seemed to favor slightly the development of Jonathan spot, but the contrast was so slight as not to justify definite conclusions. During the first weeks of storage more Jonathan spot developed on apples that were picked early than on those which were picked late, but as the period of storage was prolonged these contrasts seemed to disappear. The results, however, are believed to indicate a greater susceptibility to this trouble in the early-picked apples. Bitter pit was worse on Jonathan apples that were picked early than on those that were picked late.

The tar treatment for court-noué, L. Ravaz (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 38 (1917), No. 8, pp. 173–175*).—A discussion of reports and opinions by different investigators on court-noué as related to varieties and as affected by treatment with tar.

The results of treatment were either negative or inconclusive. The author states that the studies carried out at Montpellier for several years are still in progress regarding the characteristic internal changes, the conditions under which the trouble becomes evident, and the factors which may lead to its appearance.

Filage of grapes, L. Ravaz (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 38 (1917), No. 20, p. 462*).—This phenomenon, described as due to the arrest of floral development and excessive growth of the parts bearing flowers, is said to be related to disproportionate alimentation in cloudy or rainy weather and to be controllable by appropriate pruning operations.

Little leaf of grapevines in California, F. T. Bioletti and L. Bonnet (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 38 (1917), No. 22, pp. 517–522*).—This is a résumé of a previous report (E. S. R., 36, p. 849) by the authors, who call attention to the resemblances and differences between this trouble and some others prevalent in Europe. It is distinguished from mal nero by a different kind of leaf coloration and by the fact that the latter is not transmissible but is confined to particular areas. An important character which little leaf has in common with court-noué is the shortened internodes characterizing the latter.

Grape downy mildew, L. Ravaz (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 38 (1917), No. 12, pp. 269–277*).—This is a discussion regarding what is known of grape downy mildew (*Peronospora viticola*); its mode of attack and development on vines, leaves, branches, and grapes; its propagation; climatic, cultural, and varietal conditions favorable or unfavorable to the disease; and remedial measures.

Grape downy mildew at Montpellier in 1916, L. Ravaz (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 38 (1917), No. 16, pp. 365–373, fig. 1*).—Having conducted an official investigation of the phenomena of grape downy mildew, the author states that the several invasions are each derived from a previous one. Except for a portion which is small and unimportant from a practical standpoint, they are due to rains or mists which are sufficiently heavy to bathe the upper surface of the leaf and run over to the other side, carrying the infecting spores. Each time favorable conditions occur a contamination takes place. Between this and the appearance of the invasion (in the form of sterile or fertile spots) is the period of incubation, the length of which varies from 4 or 5 to 7 or 8 days, according to the hygrometric condition of the atmosphere.

Grape downy mildew, L. Ravaz (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 38 (1917), No. 24, pp. 557, 558*).—Continuing the above work, the author reports that vines sprayed on May 19 remained clear of mildew, which was, however,

produced in other vines by the heavy rain (100 mm.) of May 20. The grapes showed the contamination three days later than did the leaves.

The length of the interval between contamination and the evidences of attack (inoculation period) depends upon the temperature and humidity of the air, being shortest when these are 25° C. (77° F.) and 100 per cent, respectively. The conditions prevalent in early spring usually give an incubation period of seven days. From the first appearance of the white spots, each good rain produces an invasion seven days after the precipitation occurs. Spraying must be done about the end of this period to be effective. Applications made during a rain, except perhaps just at the beginning, are lost, the fungicide being washed away.

Rainfall and grape downy mildew, A. CADORET (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 38 (1917), No. 25, pp. 588, 589*).—A comparison in tabular form as regards precipitation is made between years of serious mildew attack (1910 and 1915) and years of relative freedom from such attack.

Spraying for grape downy mildew in rainy weather, A. CADORET (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 38 (1917), No. 24, pp. 565–567*).—The author reviews opinions regarding the advisability of the practice of spraying grapevines for downy mildew during humid and rainy weather.

The treatment for downy mildew, L. TABOUREAU (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 38 (1917), No. 11, pp. 255–258, fig. 1*).—This is a discussion of spraying experience and observations of the biological and meteorological phenomena connected with the development of grape downy mildew.

It is stated that years of serious mildew outbreaks are not always years of heavy precipitation. Treatment is not effective if delayed for several days after a rain or after the general occurrence of conditions favoring spore germination.

Treatment of grape downy mildew in southwest France, J. CAPUS (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 38 (1917), No. 19, pp. 444, 445*).—It is said that in soils naturally dry in spring, as in those of Médoc or Graves (in Gironde), the invasions of downy mildew which ordinarily occur in regions of moister soils do not appear. The latter part of May or the first of June is usually sufficiently early for the first sprayings. The most important period of contamination is about June 10, the corresponding invasion occurring about ten days later.

In other soils of the southwest of France the most important period for treatment is from May 15 to 31, though in case of very humid soils May 1 is late enough for the first treatment. Certain localities are supplied from the stations with special instructions regarding the time to spray. It is said to be impossible to fix the exact dates when spraying is required, as these vary from year to year, according to circumstances. Success in spraying depends upon thoroughness and care in applying 2 per cent copper sulphate.

Treatment of grape downy mildew, J. CAPUS (*Rev. Vit., 46 (1917), Nos. 1191, pp. 265–269; 1192, pp. 282–285*).—For the information of growers not so situated as to be supplied with information from stations regarding the time to spray in order to prevent outbreaks of grape downy mildew (see preceding abstract), the author states that the proper moment for the application of the spray is the most important question arising in this connection. The development of an outbreak presents three phases, namely, contamination, or penetration by the fungus, after its germination, into the plant tissue; incubation, or development of the fungus within the host, with little or no outward indication of its presence; and the appearance of the oil spots popularly termed the invasion. This development may require from 6 to 28 days, accord-

ing to temperature and humidity, and it can not be arrested at any stage beyond its inception, at which time, however, treatment properly used is absolutely effective. The primary infection develops from the bodies that have overwintered, and may occur several times. The secondary infection develops from the oil spots if conditions are favorable.

The progress of the mildew in the berries parallels that in the leaves, and both require thorough treatment.

In case of a single rain, contamination in a definite manner follows in a short time. In case of rains in close succession, repeated applications of the treatment are necessary until the end of the rainy period, particularly if this is accompanied by a lowering of temperature. Humidity and low temperature favor the development of the fungus and at the same time render the plants more receptive. During a certain period the young leaf or grape is particularly receptive to mildew, and during this time treatment should be prompt and thorough, employing a copper spray not lower than 2 per cent in concentration.

The comparative efficacy of acid and alkaline Bordeaux sprays, L. Degrully (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 38 (1917), No. 7, pp. 149–155, fig. 1*).—This is a discussion of the comparative merits of acid, neutral, and alkaline Bordeaux mixtures as reported recently by several investigators, giving prominence to the claim of superiority for the alkaline mixture made as a result of recent tests by Vermorel and Dantony (E. S. R., 38, p. 153).

Acid and alkaline sprays, V. Vermorel and E. Dantony (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 38 (1917), No. 9, pp. 201–207*).—This gives the details of the experimentation referred to above.

One series was continued for 16 days, the other for 50 days. Copper sulphate of 99.8 per cent purity was employed at 2 per cent strength in each series, the acid spray containing 0.32 per cent, the alkaline 0.96 per cent, calcium oxid. The greater persistence of the copper on the leaves in case of the alkaline spray was very marked as compared with that of the acid spray.

A second test employing the neutral in place of the acid spray showed this to give results approximately the same as regards the persistence of soluble copper on the leaves.

Acid and alkaline sprays, V. Vermorel and E. Dantony (*Rev. Vit., 46 (1917), No. 1192, pp. 285, 286*).—In a statement supplementary to that above noted, the authors discuss acid and alkaline sprays in regard to their actual contents and qualities, so far as known. They claim that the acid preparation at 2 per cent strength is actually less efficacious than the alkaline mixture at half that concentration.

Acid and alkaline sprays, A. Cadoret (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 38 (1917), No. 17, p. 394*).—In 1914 the use of acid Bordeaux spray was followed by the defoliation of the vines and the loss of the crop. In 1915, when an alkaline spray was used, the leaves were retained and the crop was normal. Lead arsenate appeared to improve the quality of adherence in the copper spray liquid.

Alkaline and acid sprays, L. Degrully (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 38 (1917), No. 11, pp. 247, 248*).—Noting an inquiry as to the meanings of the terms acid and alkaline as applied to sprays, the author states that the usual mixture of 2 per cent copper sulphate with 1 per cent lime is regarded as fully adequate and practically always alkaline, in spite of the usual impurity of the lime. The failure of the spray noted in Armagnac, where 12 or 14 sprayings are often insufficient to keep down black rot and downy mildew, is attributed to the climate, which is thought to be very favorable to mildew and black rot.

The greater duration of efficacy in case of alkaline sprays is admitted, but it is questioned whether the acid spray may not at the time of its application prove more effective against these diseases.

Mixtures of lime and sulphur, A. CADORET (*Prog. Agr. et Vit.* (*Ed. l'Est-Centre*), *38* (*1917*), *No. 11*, *pp. 258*, *259*).—Oïdium of grapevines is said to be controllable by the employment of four or five applications of the residual sulphur obtained in certain industries. This should be mixed with lime or wood ashes in the ratio of 50:50 from the end of May to June 20 and in the ratio of 60:40 between June 20 and August 1.

Rust of grapevines, L. RAVAZ (*Prog. Agr. et Vit.* (*Ed. l'Est-Centre*), *38* (*1917*), *No. 20*, *p. 463*).—Pending further study of the phenomenon, a brief description is given of an arrest of development in grapevines closely resembling that due to injury from strong copper sprays, but appearing on vines which have not been sprayed.

Report of the plant pathologist, E. W. BRANDES (*Porto Rico Sta. Rpt. 1916*, *pp. 28–31*, *pls. 2*).—In addition to an account of routine work carried on by the plant pathologist, a preliminary report is given of an investigation of banana wilt or Panama disease.

This disease, which seems to be particularly injurious to the Chamaluco variety, was previously reported in Porto Rico (E. S. R., 36, p. 352). The studies of the author have shown that it is due to a species of Fusarium which is indistinguishable from that previously described as *F. cubense*, an amplified technical description of which is given. Preliminary investigations have shown the possbility of controlling this disease by sterilization of the soil.

A more detailed account of the disease is to be given in a subsequent publication.

The geographical distribution of the citrus diseases, melanose and stem end rot, H. S. FAWCETT (*Johns Hopkins Univ. Circ.*, *n. ser.*, *No. 3* (*1917*), *pp. 190–193*).—This is a discussion of *Phomopsis citri* as an example of the failure of a parasitic organism to extend itself to the limits of the territory occupied by the host. In this case, it is suggested that humidity may constitute one factor, but it is of limited value as an illustration owing to the absence of melanose in southern Florida and in Cuba. Experimentation is now in progress regarding the temperature relations of this fungus.

Preliminary note on the relation of temperature to the growth of certain parasitic fungi in cultures, H. S. FAWCETT (*Johns Hopkins Univ. Circ.*, *n. ser.*, *No. 3* (*1917*), *pp. 193*, *194*).—This is an account of a study intended to compare the temperature-growth curves for cultures of a number of fungi producing diseases of citrus trees, but limited in their geographical distribution, with a view to the interpretation of the observed facts of distribution and seasonal occurrence and the suggestion of control measures. Cultures on solid media were studied as to daily growth under controlled conditions, and the results are detailed.

In marked contrast with the observed results reported by other workers, the author notes the fact that *Pythiacystis citrophthora* exhibited no time diminution of growth rate, which often continued unchanged for a period of eight days or more.

The June drop of Washington navel oranges, J. E. COIT and R. W. HODGSON (*California Sta. Bul. 290* (*1918*), *pp. 203–212*, *figs. 3*).—A progress report is given of a study of the June drop of this well-known variety of oranges. In the previous publication (E. S. R., 37, p. 154), *Alternaria citri* was said to be the cause of the disease. Later investigation (E. S. R., 37, p. 834) seemed to indicate that abnormal water relations also influence the dropping of fruit.

The authors report that the major part of the June drop occurs early in the season and has to do with blossoms and small fruits. It is caused by a stimulus to abscission arising from abnormal water relations within the plant due to peculiar climatic conditions. The major part of the drop of the larger oranges is caused by the fungus *A. citri.* The drop caused by water relations is considered to bear a definite relation to climatic conditions, and all efforts looking to prevention or control must be either in the nature of modifying environmental conditions or in selection for dry heat resistant strains. Attempts to control the June drop by spraying have not given any promising results.

Algal disease of cacao, J. B. Rorer (*Proc. Agr. Soc. Trinidad and Tobago, 17 (1917), No. 9, pp. 345–348*).—It is stated that an alga (*Cephaleuros virescens*) causes a leaf fall and die-back disease of cacao on practically every estate in Trinidad. This disease has been under observation since 1912 and has been described as attacking any cacao tree at any time during the year, but more readily during the last two months of the dry season especially if the trees are not in a good situation or condition. The disease has been called die-back and sun scald, but the author suggests the name of algal disease in order to distinguish it from true die-back and sun scald, which are said to be caused by a Diplodia.

Spraying with Bordeaux mixture has been attended by beneficial results, and attention to tillage, drainage, shade, and protection from wind are also considered essential to the complete control of this disease.

A full report of the disease, with illustrations, is to appear later.

The diseases . . . of the coconut palm, R. M. Richards (*Agr. Bul. Fed. Malay States, 5 (1917), No. 8–9, pp. 327–332*).—In the section of this general review of coconut palm diseases and pests here noted the author discusses, together with other diseases in neighboring territory, bleeding disease (*Thielaviopsis ethaceticus*), a leaf disease (*Pestalozzia palmarum* which may be intermingled with *Helminthosporium* sp.), a leaf breaking disease, supposedly due to *Botryodiplodia* sp., though other fungi may be present, bud rot (bacterial), and a sooty leaf fungus (*Meliola palmarum*). No root disease of coconut palm has been found in the region covered by this review.

Leaf bitten diseases of coconuts, S. F. Ashby (*Jour. Jamaica Agr. Soc., 21 (1917), No. 7, pp. 269–273*).—This is a discussion of pineapple leaf bitten disease (*Thielaviopsis paradoxa*), hard or little leaf bitten disease, and Phytophthora leaf bitten disease of coconuts as regards their causation, symptoms, and treatment.

The white pine blister rust in Canada, W. A. McCubbin (*Ann. Rpt. Fruit Growers' Assoc. Ontario, 48 (1916), pp. 81–86*).—In a somewhat general discussion of the white pine blister rust situation in Canada it is stated that observations in the Niagara district in 1916 showed that although the fungus may enter the limbs through wounds, the majority of infections seemed to occur by way of the leafshoots. From this point of entry the fungus grows in all directions in the soft bark, killing the tree eventually if it is weakly, otherwise causing a swollen and sickly appearance. A long time is required to kill a large tree, even if a number of infections work in different portions of it. The period between infection and spore formation varies from three to six years or more, but is usually about three and a half years.

During 1916 data were collected apparently supporting the conclusion that the fungus is able to winter on the currant, and thus live from year to year even when the white pine host is absent. Extended surveys in 1915 and 1916 showed that in addition to a large area of infection in the Niagara peninsula, isolated cases have occurred at Guelph, Brantford, Port Burwell, Dutton, Oak-

ville, Cookstown, Lindsay, Bowmanville, and Ottawa. At present only two points of infection are known in Quebec, namely, at Oka and St. Anne de Bellevue.

Diseases of the leaves and stem of Hevea brasiliensis in the Malay Peninsula, R. M. Richards (*Agr. Bul. Fed. Malay States, 5 (1917), No. 8–9, pp. 307–317; Proc. Agr. Conf. Malaya, 1 (1917), pp. 44–54*).—It is stated that though the Para rubber tree has shown itself to be a particularly healthy plant in the Malay Peninsula, losses have occurred following improper or inadequate management. A species of Phytophthora which is said to cause an abnormal leaf cast from July to September in Ceylon has not been observed here. The most serious stem diseases discussed are those caused by *Corticium salmonicolor* (pink disease), *Phytophthora faberi* (bark canker), *Phytophthora* sp. (decay of tapped areas), and *Botryodiplodia theobromæ* (die-back). The less harmful troubles are due to *Phyllosticta ramicola*, *Glœosporium albo-rubrum*, *Cyphella heveæ* (thread blight), and burs in the tapped areas.

Clean clearing, pests, and disease, W. R. Shelton-Agar (*Agr. Bul. Fed. Malay States, 5 (1917), No. 8–9, pp. 300–306; Proc. Agr. Conf. Malaya, 1 (1917), pp. 37–43*).—This is a discussion of rubber tree pests and diseases. The diseases are classed as those that are fatal (requiring prevention) and those amenable to treatment. The fatal class include such diseases as Fomes, Hymenochæte, Ustulina, and Poria, and the amenable class stem and bark diseases such as Diplodia, pink disease, thread blight, and cankers.

The author gives results of experience in the control of *Termes gestroi*, and observations on the various seasons of fungus attack and on the control of disease.

Preventive measures against black thread (Phytophthora faberi), H. C. Pratt (*Agr. Bul. Fed. Malay States, 5 (1917), No. 5–6, pp. 180–182*).—This is a preliminary note on the causation, progress, and treatment of black thread of rubber trees in Sumatra.

The disease is favored by light rains and an overcast sky, but ceases in dry weather. It is more prevalent on flat land and on densely shaded areas. The attack is limited mainly to the first 20 in. of basal bark. The results of tests with fungicides are tabulated. Daily disinfection is considered necessary. For this purpose izal is not so satisfactory as carbolineum. A 20 per cent strength izal burns the delicate tissue of the tapped surface, but a 10 per cent strength has proved quite satisfactory.

Note on the development of chromogenic organisms in dry raw rubber allowed to become damp, B. J. Eaton (*Agr. Bul. Fed. Malay States, 5 (1917), No. 5–6, pp. 177–179*).—The author has experimented in order to ascertain whether or not sheet rubber may develop spot diseases after being shipped in a perfectly dry and clean condition, owing to splashing or absorption of water. He claims to have found that such a change is possible, and that consequently carelessness or accidents at the shipping port may in this way injure sheet rubber in transit. It is stated that dry well-smoked sheet rubber may develop mildew, while low-grade rubber may ferment and become tacky. Thickness also appears to be a factor in susceptibility.

It appears that the presence of air is necessary for the development of the organisms or for the formation of pigments. Excessive moisture may retard or prevent the formation of the pigments which may develop after the moisture content is somewhat reduced, or it may be removed so quickly that the formation of the pigment may be prevented. These organisms may act on the protein or its decomposition products and destroy the accelerating agent, or may produce further cleavage.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Review of the grizzly and big brown bears of North America (genus Ursus), with description of a new genus, Vetularctos, C. H. MERRIAM (*U. S. Dept. Agr., Bur. Biol. Survey, North American Fauna No. 41 (1918), pp. 136, pls. 16*).—In the present review the author describes 19 new species and 4 new subspecies and erects the new genus Vetularctos, of which *V. inopinatus* n. sp., the patriarchial bear, is the type. A total of 86 forms of the grizzly and big brown bears are recognized.

The rat as a carrier of Spirochæta icterohæmorrhagiæ, the causative agent of Weil's disease (spirochætosis icterohæmorrhagica), Y. IDO, R. HOKI, H. ITO, and H. WANI (*Jour. Expt. Med., 26 (1917), No. 3, pp. 341–353*).—The author's findings, here reported, led to the conclusion that the extermination of rats and field mice is a highly important prophylactic measure against Weil's disease.

"The chemical composition of soil and water plays an important part in the development of *S. icterohæmorrhagiæ* and consequently in the spread of the disease of which it is a causative agent."

Animal parasites of rats at Madison, Wis., A. M. MOLL (*Jour. Parasitology, 4 (1917), No. 2, pp. 89, 90*).—In an examination of 25 rats captured in different parts of Madison, Wis., 53 per cent were found to be parasitized by fleas, 60 per cent by lice, 12 per cent by mites, 88 per cent by intestinal roundworms, 4 per cent by trichinæ, and 20 per cent by the dwarf tapeworm (*Hymenolepis diminuta*).

Investigations of the value of nitrobenzol as a parasiticide, with notes on its use in collecting external parasites, W. L. CHANDLER (*Jour. Parasitology, 4 (1917), No. 1, pp. 27–32*).—This is a brief report of investigations conducted to determine the action of nitrobenzol upon various animals when such animals are exposed to the vapor of this drug at various temperatures and for various periods of time.

The results show that it is impossible to predict just what effect any given condition of exposure to the vapor will have on an animal. The fact that it is impossible to kill either fleas or biting lice by any condition of exposure under that corresponding to 26° C. (78.8° F.) for six hours makes it clearly evident that this drug can not be used with any degree of safety in the fumigation of animals to destroy their external parasites.

Since it seems hardly probable that one hour's exposure to the vapor of nitrobenzol at temperatures between 20 and 25° C. (68 and 77° F.) will seriously affect any of the domesticated animals and fleas and biting lice become stupified after an hour's exposure at the same temperatures and are shaken off by the host in great quantities, it is quite possible that nitrobenzol fumigation may be used to good advantage in collecting specimens of external parasites.

A study of the toxicity of kerosene, W. MOORE and S. A. GRAHAM (*Jour. Econ. Ent., 11 (1918), No. 1, pp. 70–75*).—"Kerosene varies greatly in its physical characteristics and its chemical composition, even when coming from the same oil field. Low boiling point fractions of kerosene are in general more toxic to plants than high boiling point fractions when used pure. Injury by fractions with low boiling points can largely be prevented if they are applied to the form of an emulsion, since the emulsion holds the oil away from the plant until such time as it has evaporated. Emulsification of high boiling point fractions does not give this protection since the oil remains on the leaf after the emulsion is destroyed. Low boiling point fractions are more toxic to insects in the form of vapor than high boiling point fractions due to the slight vola-

tility of the higher fractions. High boiling point compounds are more toxic than low boiling point compounds when used as contact insecticides in the form of an emulsion."

The distribution of bird life in Colombia; a contribution to a biological survey of South America, F. M. CHAPMAN (*Bul. Amer. Mus. Nat. Hist., 36 (1917), pp. X+729, pls. 41, figs. 21*).—This report, based on 15,775 birds collected in Colombia, forms a part of an intensive zoological survey of South America, commenced by the American Museum of Natural History in December, 1910.

The first part of the work (pp. 3–169) includes a review of Colombian ornithology, a report on the American Museum's expeditions in Colombia, an outline of Colombian topography, remarks on the distribution of forests, notes on the climatology, the life zones of the Colombian Andes, the Tropical and Subtropical zones and their faunas, the Central American extension of the Subtropical Zone, the Temperate and Paramo zones, a tabular synopsis showing the zonal distribution of families of Colombian birds, etc. The second part (pp. 170–639) consists of a distributional list of birds collected in Colombia by the American Museum's expeditions in which 1,285 forms are represented.

A gazetteer of Colombian collecting stations, a list of 24 of the more important faunal papers relating to Colombian birds, and a subject index are appended.

Three new Mallophaga from North American birds, E. A. MCGREGOR (*Ent. News, 28 (1917), No. 10, pp. 433–437, pl. 1*).—*Goniodes zenaiduræ* from a mourning dove (*Zenaidura macroura*) at Aberdeen, S. Dak.; *Læmobothrium intermedium* from the sparrow hawk (*Falco sparverius*) from Minnesota and Uvalde, Tex.; and *Physostomum melospizæ* from the song sparrow (*Melospiza melodia*), St. Anthony Park, Minn., are described as new.

Eight new Mallophaga of the genus Lipeurus from North American birds, E. A. MCGREGOR (*Psyche, 24 (1917), No. 4, pp. 105–117, pls. 3*).

Field book of insects, F. E. LUTZ (*New York and London: G. P. Putnam's Sons, 1918, pp. X+509, pls. 24, figs. 628*).—This pocket handbook deals with the more common insects under their respective orders and families, with special reference to those of northeastern United States. Keys are given for the separation of many of the groups, together with illustrations, many of which are in color. Habitat and plant and entomological indexes are included.

Report of the entomologist, R. H. VAN ZWALUWENBURG (*Porto Rico Sta. Rpt. 1916, pp. 25–28, pl. 1*).—Work with ticks has shown both *Margaropus annulatus* and *M. annulatus australis* to infest cattle on the island, the latter being much the more common. From 20 to 22 days were required for the development of *M. annulatus australis* upon the host at Mayaguez. Under natural conditions at an average mean temperature of 74.7° F. in February the incubation period of the egg was 36 days, and at an average mean temperature of 79.6° in September, 23.5 days. The maximum longevity of larvæ hatching in April was 94 days under natural conditions and 108 days when protected from rain and direct sunlight.

In collections made during the spring flight both sexes of the large common species of Lachnosterna were attracted to the light of a 400 candlepower gasoline lamp in about equal numbers, only 17 per cent of the females collected having completed oviposition.

A dark-brown cricket (*Amphiacusta caraibea*) severely injured seedlings of various kinds in the station plant houses. As many as 59 eggs were laid by one female in captivity, the eggs hatching in about a month. Flour and Paris green were used with success in controlling it.

Heavy summer and fall rains resulted in a very poor honey crop during the year. Weighing experiments with shaded and unshaded colonies showed that there was no striking or consistent difference in production.

Experiments with paraffin oil emulsion as a contact insecticide have shown it to be more effective than homemade lime-sulphur when used against Porto Rican insects. A serious outbreak of the yellow aphid (*Sipha flava*) on young sugar cane at Ponce is recorded, the growth of the cane having been severely retarded and in a few cases death resulting from its attack. The outbreak was eventually controlled by natural enemies. The occurrence of *Sterictiphora zaddachi*, the larvæ of which feed on leaves of sea-grape (*Coccoloba uvifera*), and icaco (*Chrysobalanus icaco*) is noted.

Studies of the changa are noted below.

War on greenhouse pests, H. A. Gossard (*Mo. Bul. Ohio Sta., 3 (1918), No. 1, pp. 21, 22, figs. 2*).—In continuation of the paper previously noted (E. S. R., 38, p. 654) a brief account is given of control measures for greenhouse mites and cutworms.

Pecan insects, W. F. Turner (*Ga. Bd. Ent. Bul. 49 (1918), pp. 6–37, pls. 12*).—This is a general summary of information on the more important insects affecting the pecan, based upon investigations by the author and by C. S. Spooner in south Georgia, a brief report on which by Worsham has been previously noted (E. S. R., 38, p. 256).

The species considered are the pecan leaf case-bearer (*Acrobasis nebulella*), pecan nut case-bearer (*A. hebescella*), pecan cigar case-bearer (*Coleophora caryæfoliella*), pecan budworm (*Proteopteryx bolliana*), pecan shuckworm ([*Enarmonia*] *Laspeyresia caryana*), fall webworm, walnut or pecan caterpillar (*Datana integerrima*), pecan catocalas (*Catocala* spp.), twig girdlers (*Oncideres cingulata*), flat-headed apple tree borer, *Chrysobothris scitula*, *Agrilus anxius*, cossid borer (*Cossula magnifica*), red-shouldered shot-hole borer ([*Sinoxylon*] *Xylebiops basilare*), pecan ambrosia beetle ([*Xyleborus*] *Xyleborinus pecanis*), lesser pecan tree borer (*Synanthedon* [*Sesia*] *geliformis*), a pecan nut curculio (*Conotrachelus juglandis*), the hickory and pecan weevil (*Balaninus caryæ*), a leaf-feeding beetle (*Diplotaxis excavata*), a leaf-hopper (*Empoasca* sp.), pecan phylloxera (*Phylloxera* sp.), pecan aphis (*Monellia costalis*), and a spittle insect. A Farmers' Bulletin on pecan insects by Gill has been previously noted (E. S. R., 38, p. 157) as have investigations, by the same author, of the pecan leaf case-bearer (E. S. R., 38, p. 656).

The changa or West Indian mole cricket, R. H. Van Zwaluwenburg (*Porto Rico Sta. Bul. 23 (1918), pp. 28, pls. 3*).—This is a summary of the present status of knowledge of the changa, based upon a review of the literature and investigations conducted by the author, and replaces the bulletin by Barrett previously noted (E. S. R., 14, p. 885).

The changa is the most serious pest to general agriculture in Porto Rico, the general gardener sustaining the greatest losses from its attacks. Its injury is commonly caused by attacking the crown of the plant. It is shown that the species occurring in Porto Rico is *Scapteriscus vicinus* instead of *S. didactylus* as formerly supposed.

Life history studies have shown that there are usually eight molts, although occasionally there are but seven in the male. The entire period from egg to adult averaged 281 days for 11 males and 321 days for 7 females. The average duration of the instars of changas reared from the egg was 40.2, 29.4, 26.8, 27.5, 30, 47.5, 45.7. and 54.1 days, respectively. The preoviposition period of three individuals observed in the field averaged 79 days, 62 days having been the minimum and 93 days the maximum. The maximum number of eggs deposited

by a single female in captivity was 110, deposited in four lots. The duration of the egg stage averaged about 19 days, with variations from 15 to 38 days.

The natural enemies of the changa in Porto Rico are ineffective, an undetermined nematode being the single parasite that attacks it, though the fungus *Metarrhizium anisopliæ* is thought to have killed some in the breeding cage. During the fall months the changa flies in large numbers on damp overcast evenings at which time the females in particular are attracted to light. Flooding is of value in control work wherever the location of fields makes water easily available as changa eggs fail to survive a submergence of 24 hours. Naphthalin and sulphur are the only repellents found to be of any value, and even they are only partially effective. Sugar cane is protected from the changa by planting it in a perpendicular or slanting position, and hilling up the plants greatly reduces injury by this pest in gardens. Poison baits, particularly one consisting of cheap flour and Paris green, together with clean cultivation, are recommended.

A list of 54 references to the literature is appended.

The citrus thrips, J. R. HORTON (*U. S. Dept. Agr. Bul. 616* (*1918*), *pp. 42*, *pls. 3*, *figs. 10*).—This is a summary of the present status of knowledge of (*Euthrips*) *Scirtothrips citri*, based upon the author's investigations in California and a review of the literature, including earlier reports of the Bureau of Entomology, prevously noted (E. S. R., 33, p. 354). The history and distribution of the citrus thrips, nature and extent of injury, dissemination, food plants, life history and habits, seasonal history, natural checks, natural enemies, and control experiments are considered and a bibliography of 16 titles appended.

Plain lime-sulphur solution, 1 : 56 of the 36° B. density or 1 : 50 of the 33°, is recommended as the most reliable of the four best mixtures resulting from the tests, a soda-sulphur solution being the next most effective mixture. The first application should be made when four-fifths or more of the petals have fallen, at which time the orange is most susceptible to deep injury by the thrips. The second application should be timed to prevent injury both from larvæ issuing from the very young fruits and from adults emerging from the pupal stage existent at the time of the first application, i. e., from 10 to 14 days after the first spraying. The time of application of the third spray depends upon the effectiveness of the first two, it usually taking from three to four weeks for the thrips to again become dangerously numerous. "All three applications should be completed by the time the fruit is half grown, after which it rapidly loses its attractiveness for the insects, which then find it necessary to spread out over the comparatively scant tender orange growth and miscellaneous food plants.

"During the latter part of August and early in September there is usually another abundant growth of orange shoots, and upon this the thrips congregate in large numbers. A fourth application during this period is advisable in some seasons to prevent severe injury to this growth, which is often the most abundant of the season."

On nursery stock the first application should be made when the thrips become numerous on the spring growth and before their injury becomes very evident, usually between April 15 and May 15. From two to four further applications should follow the first spraying, depending upon the number of growths and the degree of infestation.

Catalogue of the Hemiptera of America north of Mexico, excepting the Aphididæ, Coccidæ, and Aleurodidæ, E. P. VAN DUZEE (*Univ. Cal. Pubs. Ent.*, *2* (*1917*), [*No. 1*], *pp. XIV+902; rev. in Science, n. ser., 47* (*1918*), *No. 1212*, *pp. 292, 293*).—This catalogue undertakes to give a complete enumeration of

all the described Hemiptera, to and including the Chermidæ, recorded from or known to occur in America north of the southern boundary of the United States. For the Heteroptera the Reuter classification of 1912 has been followed very closely, but the author has found it desirable to reduce a number of the families to subfamily rank. The international code has been followed in the determination of genotypes. A total of 3,198 accepted species are listed, of which 263 have been added since the publication of the author's check list in June, 1916 (E. S. R., 36, p. 550). The numbers given in the check list are retained and additional species interpolated in fractional form.

Additions and corrections are appended, together with a list of works cited and indexes to the genera and higher group names and species.

The review is by H. M. Parshley.

Idiocerus scurra, a poplar leaf-hopper, E. L. Dickerson and H. B. Weiss (*Jour. N. Y. Ent. Soc., 25 (1917), No. 4, pp. 218–224, pl. 1*).—This is a report of morphological and biological studies of *I. scurra* (*I. gemmisimulans*), a poplar leaf hopper introduced into this country from Europe which is becoming more abundant and widely distributed in New Jersey, having been noted in several cases occurring on poplars growing along city streets.

Gonatocerus ovicenatus has been previously recorded as parasitizing its eggs (E. S. R., 34, p. 657), and the authors have observed *G. maga* ovipositing in the tissue directly over *I. scurra* eggs.

The genus Ophiderma (Membracidæ: Homoptera), E. H. Gibson and Emma Wells (*Jour. N. Y. Ent. Soc., 25 (1917), No. 4, pp. 199–203*).—The authors recognize ten species of this genus as occurring in the United States, of which two are described as new to science.

The genus Harmostes, E. H. Gibson (*Ent. News, 28 (1917), No. 10, pp. 439–450*).—A key is given for the separation of 16 species of this coreid genus, eight of which occur north of Mexico, one being described as new.

On the Chinese gall (Aphididæ), A. C. Baker (*Ent. News, 28 (1917), No. 9, pp. 385–393, pl. 1*).—The literature relating to galls produced by aphids on *Rhus semialata*, which for many centuries have been an important article of commerce in China, is brought together and the species compared with its well-known relatives in this country. The galls produced by this aphid are employed in dyeing and tanning, as well as in native medicines, and the export of these galls in recent years has amounted to a million dollars annually. A list of references appended consists of 35 titles.

The corn root aphis and methods of controlling it, J. J. Davis (*U. S. Dept. Agr., Farmers' Bul. 891 (1917), pp. 12, figs. 6*).—A practical summary of information in which the life history of this plant louse and its association with the cornfield ant (*Lasius niger americanus*) are graphically illustrated. Control measures include crop rotation, early and deep spring plowing followed by several deep diskings, the use of a substance offensive to the ants to be applied with a chemical fertilizer to prevent their colonizing the aphids on corn roots, and the maintenance of soil fertility through the use of barnyard manure or other fertilizer as an aid in producing stronger plants.

Control of the melon aphis, F. H. Chittenden (*U. S. Dept. Agr., Farmers' Bul. 914 (1918), pp. 16, figs. 9*).—A popular account of this pest with directions for its control. The use of 40 per cent nicotin sulphate, 3 fluid ounces; water, 25 gal.; and laundry soap, 1 lb., is said to have given the best results thus far. The importance of using plenty of spray, 200 gal. to the acre, applied at high pressure, if possible, is emphasized.

Cattle lice and how to eradicate them, M. Imes (*U. S. Dept. Agr., Farmers' Bul. 909 (1918), pp. 26, figs. 14*).—A popular summary of information relative to suctorial and biting lice, their life history and habits, and methods of

treatment, including plans for a dipping plant. Arsenical dips, coal-tar creosote dips, and nicotin solutions may be used for dipping cattle to destroy lice, two or more treatments with one of which should be given 15 to 16 days apart.

Methods of control of the clothes louse (Pediculus humanus [vestimenti]), W. Moore (*Jour. Lab. and Clin. Med., 3 (1918), No. 5, pp. 261–268*).—The author's investigations here reported, conducted at the Minnesota Experiment Station, show that sachets (small bags) of naphthalene, camphor, sulphur, paradichlorbenzene, and various other chemicals, worn about the neck or the waist, are not successful in eliminating the body louse.

"Talc 20 gm., creosote 1 cc., sulphur 0.5 gm. is six times as effective a louse powder as NCI [naphthalene 96 per cent, creosote 2 per cent, and iodoform 2 per cent], causing less irritation to the skin and, being dry, is easier to apply. Impregnation of the underwear does not appear promising, but a cheesecloth suit impregnated with saturated solution of sulphur in creosote could be successfully worn outside the underwear. Chlorpicrin can be used as a fumigant, penetrating the clothing and killing the lice in all parts of the clothing in 15 minutes and the eggs in 30 minutes. By increasing the heat in the fumigation chamber, the time required to kill the eggs could be reduced."

[Papers on body lice] (*Parasitology, 10 (1917), No. 1, pp. 188, pls. 3, figs. 12*).—The articles here presented on body lice are as follows: Bibliography of Pediculus and Phthirus, including Zoological and Medical Publications Dealing with Human Lice, Their Anatomy, Biology, Relation to Disease, etc., and Prophylactic Measures Directed Against Them (pp. 1–42), The Part Played by *Pediculus humanus* in the Causation of Disease (pp. 43–79), and The Biology of *P. humanus* (pp. 80–185), by G. H. F. Nuttall; and Notes on Head and Body Lice and upon Temperature Reactions of Lice and Mosquitoes, by F. M. Howlett (pp. 186–188).

The pink bollworm of cotton, E. E. Scholl (*Farm and Ranch, 36 (1917), No. 50, p. 2, figs. 4*).—A brief account of the appearance of this pest in Texas and measures taken for its eradication. A law enacted by the Texas legislature which became effective December 28, 1917, makes it possible for the governor to quarantine any county or area where the pink bollworm is found and he may, upon the advice of the U. S. Secretary of Agriculture, restrict and regulate the growing of cotton in the border counties when the pink bollworm is found in Mexico within 50 miles of the Rio Grande.

Report on the pink bollworm in the cotton districts of northeastern Brazil, A. M. da Costa Lima (*Relatorio sobre a Lagarta Rosea do Capulho (Pink Bollworm) nos Algodoeiros do Nordeste. Rio de Janeiro: Govt., 1917, pp. 50, pls. 4; rev. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 12, p. 537*).—This is a report to the Brazilian minister of agriculture on the pink bollworm ([*Gelechia*] *Pectinophora gossypiella*) in Brazil, accounts of which pest in that country by Hunter (E. S. R., 37, p. 358), Busck (E. S. R., 37, p. 564), and Green (E. S. R., 38, p. 562) have been previously noted.

Notes on its natural enemies and on other cotton pests in northeastern Brazil are included, as is a bibliography of 28 titles.

Outbreaks of the elegant looper (Philtræa elegantaria) on privet in Louisiana, E. S. Tucker (*Ent. News, 28 (1917), No. 9, pp. 394–396*).—These notes relate to the occurrence of the elegant looper on Amoor privet (*Ligustrum amurense*) at Baton Rouge, La., in May and June, 1913. There was a high percentage of parasitism by *Chalcis ovata*, and specimens of *Eutelus* sp. and *Phorocera* (*Euphorocera*) *claripennis* were also reared.

Descriptions of some lepidopterous larvæ from Mexico, H. G. Dyar (*Insecutor Inscitiæ Menstruus, 5 (1917), No. 7–9, pp. 128–132*).

A new pyralid from California, H. G. DYAR (*Insecutor Inscitiæ Menstruus, 5 (1917), No. 7–9, p. 132*).

Brabantia rhizoleuca, redescribed, H. G. DYAR (*Insecutor Inscitiæ Menstruus, 5 (1917), No. 10–12, p. 169*).

The genus Culex in the United States, H. G. DYAR and F. KNAB (*Insecutor Inscitiæ Menstruus, 5 (1917), No. 10–12, pp. 170–183*).—The author presents notes on 17 species of Culex, including two new species; and on three additional species belonging to other genera. A table for the separation of subgenera of Culex by the male genitalia and a table for the separation of species of Culex by coloration are included.

The mosquitoes of the Pacific Northwest, H. G. DYAR (*Insecutor Inscitiæ Menstruus, 5 (1917), No. 7–9, pp. 97–102, pl. 1*).

The larva of Aedes idahoensis, H. G. DYAR (*Insecutor Inscitiæ Menstruus, 5 (1917), No. 10–12, pp. 187, 188*).

A second note on the species of Culex of the Bahamas, H. G. DYAR (*Insecutor Inscitiæ Menstruus, 5 (1917), No. 10–12, pp. 183–187*).—This second note (E. S. R., 34, p. 553) gives a list of mosquitoes of the Bahamas collected in 1903 by T. H. Coffin,[1] together with the corrected nomenclature as supplied in the monograph of Howard, Dyar, and Knab (E. S. R., 37, p. 762). A description of one new species and records of two additional forms are included.

Dytiscus as a destroyer of mosquito larvæ, F. E. CHIDESTER (*Ent. News, 28 (1917), No. 10, p. 454*).—The author finds that while dytiscid larvæ may be of considerable importance in killing mosquito larvæ when the latter are present in great numbers, complete extermination by them where the mosquito larvæ are widely distributed is not probable.

New American mosquitoes, H. G. DYAR and F. KNAB (*Insecutor Inscitiæ Menstruus, 5 (1917), No. 10–12, pp. 165–169*).—Four species of mosquitoes are here described as new.

Notes on Aedes curriei, H. G. DYAR and F. KNAB (*Insecutor Inscitiæ Menstruus, 5 (1917), No. 7–9, pp. 122–125*).

Notes on Aedes at Lake Pend d'Oreille, Idaho, H. G. DYAR (*Insecutor Inscitiæ Menstruus, 5 (1917), No. 7–9, pp. 102–104*).

Notes on the Aedes of Montana, H. G. DYAR (*Insecutor Inscitiæ Menstruus, 5 (1917), No. 7–9, pp. 104–121*).

A new Aedes from the Rocky Mountain region, H. G. DYAR (*Insecutor Inscitiæ Menstruus, 5 (1917), No. 7–9, pp. 127, 128*).

A note on the mode of existence of flies during winter, R. P. MCDONNELL and T. EASTWOOD (*Jour. Roy. Army Med. Corps, 29 (1917), No. 1, pp. 98–100*).—The continued occurrence of adult flies in houses, hutments, and elsewhere in France following a few days of sunny weather, notwithstanding the extreme cold experienced in the latter part of February and early part of March, led the authors to conduct the investigations here reported.

No hibernating flies could be found, but examinations of manure heaps indicated that eggs deposited in late autumn and covered over or otherwise buried in the heap may hatch as a result of the warmth in the depths of the manure. Such larvæ continue to feed and eventually pupate, in which stage they may remain until spring or appear as adult flies hatched out by a few warm days, the heat of which has penetrated the superimposed layers of manure, thus accounting for the fact that adult flies are frequently encountered in wintertime. The finding of living fly larvæ and pupæ in such numbers in manure heaps is considered remarkable on account of the extreme cold during the late winter, when from 18 to 20° of frost were experienced for many days.

[1] The Bahama Islands, edited by G. B. Shattuck (New York: The Macmillan Co., 1905, pp. 275–289).

"It would appear that manure heaps may be a source of danger at any time of the year, and if the spread of flies is to be prevented, manure should either be burnt, or spread out in thin layers; dumping in the immediate vicinity of camps and buildings should be avoided. Covering over the heaps with earth, or sowing the surface with grass or other seeds, would appear to be of doubtful value once eggs are deposited in the manure.

"In the month of March, the presence of living fly larvæ was demonstrated in a mixture of earth and human excreta made six months previously; it would seem therefore that reliance can not always be placed on the method of disposal in shallow trench latrines as a preventive of fly breeding; in some soils the disappearance of excreta is slow."

Interrelations of fruit-fly parasites in Hawaii, C. E. PEMBERTON and H. F. WILLARD (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 5, pp. 285–295, pls. 4*).—This is a report of studies made in connection with the work previously noted (E. S. R., 38, p. 659).

The observations have shown that where Mediterranean fruit fly larvæ have been parasitized by both *Opius humilis* introduced from South Africa and *Diachasma tryoni* introduced from Australia, *O. humilis* was killed and *D. tryoni* developed to maturity. *D. fullawayi*, a later introduction, and *D. tryoni* have been responsible for the great suppression of *O. humilis*, which is more hardy and prolific than either of the two species of Diachasma and more generally efficient than both combined. *Tetrastichus giffardianus*, a late introduction into Hawaii, has proved decidedly destructive to any of the opiines when occurring in the same fly larvæ or puparia with them, and has given but small promise of accomplishing any perceptible control of the fruit fly.

It is thought that sufficient evidence is presented to prove the superiority of *O. humilis* over the other introduced fruit fly parasites in Hawaii, and to demonstrate the decided restraint operated over it by the unfailing cannibalistic activities of the larvæ of *D. tryoni* in particular and of the other parasites in part. Since *O. humilis* has a capacity of parasitizing from 80 to 90 per cent of the larvæ of the fruit fly in favorable localities, such as the large Kona coffee belt, the authors maintain that detrimental results to a certain extent have arisen from the liberation in Hawaii of parasites other than *O. humilis* that attacked the larvæ of the fruit fly. As a result the total parasitism has been reduced to that of a parasite of secondary value.

A new ortalid from the Philippines, F. KNAB (*Insecutor Inscitiæ Menstruus, 5 (1917), No. 7–9, pp. 125–127*).

New genera of Amobiinæ, C. H. T. TOWNSEND (*Insecutor Inscitiæ Menstruus, 5 (1917), No. 10–12, pp. 157–165*).—In this paper, which deals with one of the two subfamilies of Sarcophagidæ, the author erects 11 genera and describes the type species of three.

Five new species of North American Tachinidæ, H. E. SMITH (*Psyche, 24 (1917), No. 5, pp. 137–141*).—*Homœonychia rapæ*, one of the species here described as new, was reared from the imported cabbage worm at Melrose Highlands, Mass.

The white grubs injuring the sugar cane in Porto Rico.—I, Life histories of May beetles, E. G. SMYTH (*Jour. Dept. Agr. P. R., 1 (1917), No. 3, pp. 141–169*).—This is a continuation of the report of investigations of the May beetles previously noted (E. S. R., 38, p. 161).

The infection of *Phyllophaga vandinei* n. sp. with *Metarrhizium anisopliæ* and *Micrococcus nigrofaciens* is first reported, followed by accounts of work with the common white grub (*P. portoricensis* n. sp.), the south coast white grub (*P. guanicana* n. sp.), the citrus white grub (*P. citri* n. sp.), and the

little brown May beetle (*Phytalus insularis* n. sp.), previously referred to as Lachnosterna "grande," "media," "media (northern form)," and "pequeña," respectively (E. S. R., 36, p. 753). As with *P. vandinei* the life cycle of all four of these species covers just one year.

Synopsis of the coleopterous family Cisidæ (Cioidæ) of America north of Mexico, C. Dury (*Jour. Cincinnati Soc. Nat. Hist., 22 (1917), No. 2, pp. 1–27*).—The beetles of this family are said to live in woody fungi of the different polyporoid kinds. "The North American species are of but little economic importance so far as is known, though they and their larvæ are voracious feeders on the substance of the inner parts of woody fungi."

How to reduce weevil waste in southern corn, C. H. Kyle (*U. S. Dept. Agr., Farmers' Bul. 915 (1918), pp. 7, figs. 3*).—It is pointed out that a great increase in loss results when corn is stored with short, loose shucks, and that such corn should be fed or sold as rapidly as possible. Corn in which the shucks extend beyond the tips of the ears and close tightly about the silks is weevil proof, both in the field and in storage. When necessary to store corn that does not have good shuck protection, the damage can be reduced by shelling, cleaning, and placing the corn in bags of closely woven cloth.

A key to the known species of South Carolina ants, with notes, M. R. Smith (*Ent. News, 29 (1918), No. 1, pp. 17–29*).

Notes on parasitic Hymenoptera, A. A. Girault (*Bul. Brooklyn Ent. Soc., 12 (1917), No. 5, p. 118*).—The tetrastichinid genus Neomphaloidomyia is erected and two species described as new. One of these, *Hypoptcromalus percussor*, was reared from the larvæ of *Zotheca tranquilla* at Wenatchee, Wash.

New Australian chalcid flies, A. A. Girault (*Insecutor Inscitiæ Menstruus, 5 (1917), No. 7–9, pp. 133–155*).—This paper, which is in continuation of that previously noted (E. S. R., 37, p. 569), contains descriptions of 29 new species, and nine genera are erected. Among the new species is *Dibrachys australia*, reared from the codling moth at Glen Innes, N. S. Wales.

The North American species of Trigonoderus, females, A. A. Girault (*Ent. News, 28 (1917), No. 9, pp. 396, 397*).—Five species of the genus are recognized, of which four are described as new.

Ichneumons v. Apanteles, H. Donisthorpe (*Ent. Rec. and Jour. Variation, 29 (1917), No. 11, p. 231*).—These notes relate to observations of the braconid parasite *Apanteles glomeratus* and two ichneumonids (*Hemiteles fulvipes* and *Panargyrops pellucidator*), all reared from *Pieris brassicæ*.

FOODS—HUMAN NUTRITION.

Proceedings of the Twenty-first Annual Convention of the Association of American Dairy, Food, and Drug Officials (*Amer. Food Jour., 12 (1917), No. 9, pp. 453–500*).—The proceedings of this convention, held in Atlantic City from July 31 to August 3, 1917, are given in full. The subjects under discussion included Grades for Canned Corn, Peas, and Other Foods; Commercial Edible Fats; Sanitation and Health from the Food Standpoint; Report of the Committee on Swells and Springers in Canned Goods; the Law as Laid Down in the Iowa and Pennsylvania Department of Ice Cream Cases; the Essentials for Clean Milk Production; and the Use of Inferior Ingredients and Cheap Substitutes.

Native wild mushrooms for food (*Missouri Bot. Gard. Bul., 5 (1917), No. 8, pp. 119–129, pls. 7*).—A discussion of the food value of mushrooms, methods of preservation, and means of distinguishing the edible from the inedible varieties.

Food supply in families of limited means.—A study of present facts of the food problem in Boston families, by six welfare agencies, members of the League for Preventive Work, M. M. DAVIS (*Boston: League for Preventive Work, 1917, pp. 24*).—The author concludes from this study that "the general public needs to be much more fully awakened to the serious effect of present food prices upon the nutrition of families of small means, particularly families in which there are many young children." An increase of income as well as food instruction may be necessary in the lower income group. "Present food conditions obviously demand of all charitable societies which administer material relief that they revise and study carefully the money standards of income which they are providing for their families." Each social worker should have a general knowledge of food values and should advise with a trained dietitian on problems of the food budget for the families.

Cost of living in the District of Columbia, [I–V] (*Mo. Rev., U. S. Bur. Labor Statis., 5 (1917), Nos. 4, pp. 1–17; 5, pp. 1–12; 6, pp. 1–18; 6 (1918), Nos. 1, pp. 1–12; 2, pp. 1–12*).—This is a series of reports of the findings of the special agents of the Bureau of Labor as to the cost of living of wage earners in the District of Columbia.

In the initial report, a summary view of family incomes in the District is given. It is shown that a large proportion of families, both white and colored, in Washington receive incomes of $900 to $1,000, which are held to be inadequate to maintain a normal family in comfort.

The second report presents a summary of family expenditures. The fact that a very large proportion of the low-income families of Washington are not spending enough money upon food to maintain the family members in good health is brought out. Family expenditures for food, clothing, housing, sickness, amusement and recreation, insurance, car fare, and other incidentals are also discussed.

In the third report, dealing with the feeding of the family, a special dietary study made by the Bureau of Labor in cooperation with the Office of Home Economics of the U. S. Department of Agriculture is reported, which records the dietaries of 31 families. These dietaries are analyzed and comments made on those of selected families. The conclusion is reached that 30 cts. per day is the least sum upon which an adult male could be properly fed in 1917 at the prices then prevailing. It is further pointed out that this sum is extremely low, and that even when no allowance is made for waste and ignorance a very large number of families covered by the investigation fall below the "minimum of subsistence" line and many far below.

The fourth report deals with wage-earning women, who they are and what they do. A general consideration of the personal and working conditions of 600 wage-earning women is presented.

In the fifth report, dealing with wage-earning women and their clothing, it is pointed out that of 600 wage-earning women of Washington studied 82 per cent spent less than $150 per year for clothing, 93.5 per cent less than $200, and only 6.5 per cent as much as $200.

Food supply of Jamaica in relation to the great war, H. H. COUSINS (*Ann. Rpt. Dept. Agr. Jamaica, 1917, pp. 1–6*).—The fact that Jamaica is well adapted for the production of a variety of foodstuffs and can obtain very large yields per acre is emphasized. An increased production of the native foodstuffs for 1917 was predicted. That the people are quite largely dependent upon imported fish, bread, and dairy products is also brought out.

[Public dining room service].—Five per cent of population eat in public dining rooms (*Hotel Mo., 26 (1918), No. 300, p. 55*).—The estimate is made that the hotels, restaurants, and dining cars of the United States feed approxi-

mately 3 per cent of the population; and that hotels, restaurants, lunch rooms, and cafeterias of the large cities feed approximately 5 per cent of the population.

Suggestions sent to the State institutions of California for food conservation in accordance with the proclamation of the United States Food Administration, M. E. Jaffa (*Cal. Bd. Health Mo. Bul., 13 (1918), No. 9, pp. 417–422*).—Suggestions are given for conserving food in hospitals, prisons, reform schools, and homes for the feeble-minded according to the suggestions of the U. S. Food Administration. The suggestions are arranged according to food classifications, and include how to conserve meats, flours and meals, bread, breakfast foods, pastes, sugar, butter, and fats.

How to use left-overs (*[New York]: Mayor Mitchel's Committee on Food Supply, 1915, pp. 32*).—Suggestions and recipes for the utilization of left-over foods are given.

The effect of omnivorous and vegetarian diets on reproduction in the albino rat, J. R. Slonaker and T. A. Card (*Science, n. ser., 47 (1918), No. 1209, pp. 223, 224*).—Results are given of an experiment now in its fifth year to show the effect of a vegetarian diet as compared with an omnivorous diet on reproduction in the albino rat. The general conclusion reached is that a vegetarian diet not only reduces the vitality, the growth, and the ability to reproduce, but tends to the extermination of the race.

ANIMAL PRODUCTION.

[Velvet beans compared with cottonseed meal, corn, and dried blood for live stock] (*Alabama Col. Sta. Bul. 198 (1917), pp. 103–122*).—In this continuation of work previously noted (E. S. R., 36, p. 563), three experiments are reported.

I. *Velvet beans compared with cottonseed meal for fattening steers*, by G. S. Templeton and E. Gibbens (pp. 103–109).—In this experiment, carried out in the winter of 1916–17, the steers were of different quality and the velvet beans were prepared in another way from the previous year. The animals averaged 773 lbs. in weight at the beginning of the experiment which lasted 137 days. They were in lots of 15 each. The beans were fed in the pod mixed with the silage. After four weeks they were soaked in water 12 hours before feeding. The local prices of the feeds were, cottonseed meal $38, velvet beans in pod $20, and corn silage $3 per ton.

The lot of steers on velvet beans in pod and corn silage for 119 days gained an average of 1.6 lbs. each daily at a cost of 9.3 cts. per pound of gain, and the lot on cottonseed meal and corn silage gained an average of 1.55 lbs. each daily at a cost of 10.42 cts. per pound of gain.

The steers cost 6 cts. per pound when put on feed, and the velvet bean lot was sold at 9.75 cts. per pound, netting a profit of $19.62 each. The cottonseed meal lot sold for 9.4 cts. per pound and returned a profit of $16.39 each.

In this experiment 1 lb. of cottonseed meal was equal to 2.05 lbs. of velvet beans in pod. The velvet bean lot, however, consumed only two-thirds the amount of silage as the cottonseed meal lot. The velvet bean ration was relished by the animals.

II. *Velvet beans v. cottonseed meal as feeds for dairy cattle*, by G. S. Templeton and H. C. Ferguson (pp. 110–117).—The object of the experiment was to determine the value of velvet beans in the production of milk and milk fat and the relative cost compared with cottonseed meal. Two lots of five cows

each were fed for 28 days and after 7 days reversed and fed for 28 days more. One lot was fed a mixture of corn meal and cottonseed meal, 7:8, with corn silage, and the other lot velvet beans in pod, ground, and corn silage.

More milk and milk fat were produced on the corn meal-cottonseed meal ration, but the cost was lower on the velvet bean ration.

In a second experiment two lots of four cows each were fed for the same periods as in the preceding. One lot was fed corn meal and cottonseed meal, 4:3, with corn silage, and the other corn meal and velvet beans and pod meal, 4:6, with corn silage. As in the previous experiment, more milk and milk fat were produced on the cottonseed meal ration, but on the velvet bean meal ration the cost was lower. With cottonseed meal at $40 per ton the velvet beans were worth $15.80 per ton for milk and $15.92 for milk-fat production. One lb. of cottonseed meal was equal in feeding value and economy to 2.5 lbs. of velvet beans in the pod.

The velvet beans were not palatable to all the cows. The consumption varied between 11 and nearly 4 lbs. daily per animal. The milk flow and the maintenance of body weight of individual cows on the velvet bean rations varied with the amount each consumed.

III. *Velvet bean pasture compared with corn and dried blood; velvet bean meal compared with corn for fattening hogs*, by G. S. Templeton (pp. 118–122).—The farmers of Alabama are using the velvet bean in two ways with hogs. The more common method is to gather the corn after frost has killed the velvet bean vines growing over it and then turn the pigs in the field. The other method is to gather the ripe beans and feed as a concentrate.

An experiment was made with three lots of pigs of five each with corn and dried blood, 10:1, as concentrates. Lot 1 was fed a full ration alone, lot 2 a half ration (2 lbs. to each 100 lbs. live weight) with the pigs on velvet bean pasture, and lot 3 a one-fourth ration (1 lb. to 100 lbs. live weight) on velvet bean pasture.

Valuing the corn at $1 per bushel, the dried blood at $60 per ton, and the velvet bean pasture at $2.83 per acre, it cost $6.59 to produce 100 lbs. increase in lot 1, $4.91 in lot 2, and $4.02 in lot 3.

In another experiment lot 1 was fed corn meal and lot 2 corn meal and velvet bean meal without the pods, 1:1. It took 483.57 lbs. of the corn meal to produce 100 lbs. gain and 537.64 lbs. of the mixture. Valuing the corn at $1 per bushel and the velvet beans at $34 per ton, it cost 8.64 cts. per pound of gain with the corn meal and 9.37 cts. with the mixture.

The melting point of the lard from the corn-fed lot was 46.04° C. and from the corn meal-velvet bean meal lot 44.35°. The carcasses of the latter were slightly darker. All carcasses were firm.

Palm-kernel cake, palm-kernel meal, and coconut cake, compared with soy cake, for fattening cattle, young store cattle, and fattening sheep, 1915–16, D. A. Gilchrist (*County Northumb. Ed. Com. Bul. 25* [*1917*], *pp. 8*).—During the years 1912 and 1913 Germany imported an average of 248,000 tons palm kernels, 109,000 tons copra, 445,000 tons linseed and linseed meal, 217,000 tons cotton seed, 125,000 tons soy beans, and 84,000 tons peanuts. Large quantities of these are now diverted to England and the experiments here reported were made to determine the best utilization of the resulting by-products.

Four lots of three bullocks and four of three heifers each were used in the trials with fattening cattle. Lot 1 was fed daily a standard ration per 1,000 lbs. live weight made up of 78 lbs. swedes, 14 lbs. seeds hay, 2.25 lbs. soy cake, and 4 lbs. Egyptian cotton cake. In lot 2 the cotton cake was replaced with

4 lbs. palm-kernel cake, in lot 3 with 4 lbs. palm-kernel meal, and in lot 4 with 4 lbs. coconut cake. During the third and fourth months 1 lb. of these four cakes in the four rations was replaced with 0.25 lb. soy cake and 0.5 lb. maize meal to make the rations more palatable. The bullocks during the four months made average gains each per week as follows: Lot 1, 16.5; lot 2, 12.44; lot 3, 14.19; and lot 4, 15.7 lbs. The average profits per head for the four months were for lot 1, £4 5s. 4d. ($20.77); lot 2, £3 2s. 4d.; lot 3, £5 19s. 7d.; and lot 4, £3 10s. 3d., respectively. The heifers gained 8.92, 10, 9.25, and 7.42 lbs. each per week, respectively. The profits were for the entire period per head as follows: Lot 1, £2 14s.; lot 2, £3 4s. 1d.; lot 3, £2 19s. 5d.; and lot 4, £2 9s. 7d., respectively.

In the experiment with store (stocker) cattle just over six months old three lots of 11, 5, and 6 head, respectively, were used. Lot 1 was fed a daily ration per 500 lbs. live weight of 10.5 lbs. seeds hay, 0.5 lb. soy cake, and 2.5 lbs. palm-kernel cake; lot 2, 10.2 lbs. seeds hay, 0.5 lb. soy cake, and 2.5 lbs. palm-kernel meal; lot 3, 25 lbs. swedes, 6 lbs. seeds hay, 1 lb. soy cake, and 2 lbs. palm-kernel cake. The average weekly gains per head were for lot 1, 7.44 lbs.; lot 2, 9.5 lbs.; and lot 3, 11.06 lbs. The profits per head for the 16 weeks of the experiment were for lot 1, 10s.; lot 2, £1 3s. 3d.; and lot 3, 10s. 1d. Lots 1 and 2 were wintered outside and lot 3 inside. Lot 3 made better average gains, but the lots wintered outside were in better feeding condition and valued higher in the spring.

The sheep were divided into three lots of 16 each and fed the following rations daily per 100 lbs. live weight: Lot 2, 8 lbs. swedes, 1.5 lbs. seeds hay, 0.4 lb. soy cake, 0.4 lb. Egyptian cotton cake, and 0.25 lb. maize meal; lot 2, 7.2 lbs. swedes, 1.2 lbs. seeds hay, 0.4 lb. soy cake, and 0.5 lb. palm-kernel cake; and lot 3, 8 lbs. swedes, 1.2 lbs. seeds hay, 0.4 lb. soy cake, and 0.5 lb. palm-kernel meal. Those with cotton cake in the ration gained an average of 1.82 lbs. per week, with palm-kernel cake 1.8, and with palm-kernel meal 1.89. The gains above expenses for the three months of the trial were for the three lots 3s.; 4s. 6d.; and 5s. per head, respectively.

Palm-kernel meal containing less than 2 per cent of oil gave better results with all the animals than palm-nut cake containing nearly 6 per cent. The meal and cakes were stored in a granary and kept in good condition for some months. No difficulty was encountered in getting the animals to eat them. The composition of the cakes and meal used in the experiments is shown.

Analyses, by S. H. Collins, of the feeds used are given.

The question of silage and its fermentation, E. Perroncito (*Ann. R. Accad. Agr. Torino, 58 (1915), pp. 219, 220*).—Preliminary work with the organisms concerned in fermenting silage is outlined.

Commercial feeding stuffs, 1916–17, C. D. Woods et al. (*Maine Sta. Off. Insp. 84 (1917), pp. 53–120*).—Tabulated data are given as to the registration and the general results of the examination of about 700 samples of feeding stuffs.

Live stock in Colorado, with special reference to beef cattle and sheep, C. I. Bray (*Denver: Colo. Bd. Immigr., [1917], pp. 18 figs. 2*).—The live-stock industry in Colorado is described and information of value to newcomers to the State is detailed.

Cattle rearing, W. Bruce (*Trans. Highland and Agr. Soc. Scot., 5. ser., 28 (1916), pp. 164–180*).—Attention is called to the great change in the Scottish cattle industry whereby cattle rearing has been replaced by cattle feeding as the more general practice. This article is timely because of the scarcity

of feeders, and seeks to bring out the methods of producing good commercial cattle rather than pure-bred breeding stock. In the former case the animals must be grown on the minimum amount of economical feeds and must recoup from a narrow range of prices compared with the possibilities of breeding cattle.

The natural system.—Where there is a scarcity of housing but sheltered fields and second- or third-rate grass, animals may be kept out all winter living on what they gather, supplemented with a little second-rate hay or a few turnips fed on the grass. Cattle that lend themselves to this method of wintering are Galloway and West Highland breeds. The slowness in maturity of their offspring may be somewhat overcome by breeding them to the Shorthorn, this breed having proved from experience best for using on these hardy outwintered cows.

The best calving time for these cows is early in April. The animals should be tied up for a week or two at this time so that they may be better attended to and gentled. The calves should be weaned, put on extra feed, and housed by the beginning of October. Both dams and calves can then be put into good condition for the winter. The cost of raising cattle by this method varies chiefly with the value of the grazing.

A second method of rearing cattle employs housing, thus permitting the use of the better and earlier maturing, though less hardy, beef breeds. Describing the method as carried out at Camperdown the cows calve in February, except the heifers which, for their further development, are allowed to go till April. The cows are fed on turnips and oat straw until they go on grass in May, while the calves are allowed access to the same feed as early as they desire. The calves are weaned in October and put on a ration of turnips and straw and 1 lb. of cake and 1 lb. of dried grain daily. The concentrated ration is increased gradually to 3 lbs. per head after midwinter. At the commencement of the grazing season the following spring the cake is increased to from 5 to 6 lbs. daily. The calves are later brought into the yards and finished off with turnips, straw, hay, and at the end 8 lbs. of concentrated feeds. They are sold to the butcher between November and the middle of January, weighing from 10 to 13 cwt. at from 21 to 22 months of age. After the calves are weaned in October the cows are grazed until the middle of December and then housed in the cattle yards, where, except for an occasional airing on a good day, they pass the winter on turnips and oat straw.

The author describes methods whereby two, four, and even five calves are suckled by one cow during a season. In this system the cows must be good milkers and the pasture abundant. The cows must be watched closely and additional food beyond grass, turnips, and straw given when the conditions demand.

After the calf is born it is rubbed dry and a bought-in calf tied with it behind the cow and both allowed to suckle three or four times daily. After a few weeks all are turned out together. At the end of June or the beginning of July the calves are taught to eat linseed cake and bruised oats and weaned, the cow tied up, and two young calves put to suckle her. These are weaned late in the year and in some cases one more calf put upon the cow.

The artificial system.—Three lines of hand feeding calves are generally followed: First, the young calf is fed mostly whole milk for three or four months, and in the meantime taught to consume other feeds. Second, it is fed skim milk, with some substitute for the butter fat removed. Third, when milk is very dear, the calves are fed substitutes after the first week or two.

A number of experiments made in Scotland and Ireland are cited and discussed. The author describes one in which he reared calves on 100 gal. of whole milk each, which with a good cow means about eight calves, using calf meal, cake, and grain as supplements. The scheme as carried out was as follows:

Beginning the first week the calf was given 8 gal. of milk, which was increased to 10.5 gal. from the second to the fourth and then gradually decreased to 1.75 gal. the sixteenth week. Beginning the fourth week the calf was fed 10 pints of gruel, which was gradually increased to 42 pints the twelfth week and reduced to 28 pints by the sixteenth. At the seventh week 1.75 lbs. of calf meal was fed, which was gradually increased to 7 lbs. weekly at the sixteenth. Good hay was given after four weeks, and turnips and grass when the calves would take them. The calf up to 16 weeks consumed 100 gal. of milk, 47 gal. of gruel, and 88 lbs. of calf meal.

The calf meal was made up of linseed meal, crushed linseed, wheat parings, and locust-bean meal, 4:2:1:1. The gruel was made of from 2 to 3 lbs. of calf meal made into a paste with 1 qt. of cold water, to which was added 1 gal. of boiling water and fed at blood heat.

[Prickly pear for cattle], F. Smith (*Queensland Agr. Jour., n. ser., 6 (1916), Nos. 4, pp. 239–244; 5, pp. 304–307*).—This is the first and second progress report of work on this subject at the prickly-pear feeding station at Wallumbilla.

In studying the comparative values of scrub and forest pear in stock feeding no essential difference was found by analyses. That the animals selected one in preference to another seemed due to the number and condition of the spines borne and not to any difference in flavor or palatability.

In maintenance feeding prickly-pear feeding alone does not suffice but is more efficient with a medium amount of nonnitrogenous roughage. Pear with small amounts of nitrogenous concentrates or leguminous hay conserves weight and permits small gains. With supplementary feeds the animals will eat more of the pear than when on a feed of it alone. The amount of pear consumed depends largely upon the individuality of the animal. In minimum amounts nitrogenous feeds added to the ration will cause a longer consumption of pear than nonnitrogenous. Too large a use of supplementary feeds will cause a lessened consumption of pear.

Slicing pear to make it acceptable to the animals is preferred to singeing. Under the methods employed at the station one man can handle and distribute pear for from 50 to 60 head of cattle per day. In five months of feeding no animal showed any trouble from eating pear prepared in this way. Scouring was not pronounced except in cases where pear was fed alone or in amounts in the ration of over 90 lbs. daily.

Future work in feeding pear is outlined. See also the articles previously noted (E. S. R., 38, pp. 571, 572).

Wool price calculator (*Canada Dept. Agr., Live Stock Branch Pamphlet 13 (1916), pp. 71*).—A calculating device is described.

Age affects rate and economy of gains in hogs (*Mo. Bul. Ohio Sta., 3 (1918), No. 1, p. 29*).—In the first experiment the pigs, shortly after weaning time, were placed on a ration of corn, middlings, and tankage (10:4:1), and in the second a ration of corn and tankage was fed. The corn and tankage was fed in the proportion of 8:1 at first, the corn being increased one-fourth part weekly for 24 weeks, after which the ratio remained constant.

The following table shows by 100-lb. intervals the average results of the two experiments:

Effect of age on rate and economy of gains in pigs.

Weight of pigs.	Number of pigs.	Average daily gain.	Average time required.	Feed per pound of gain.
		Pounds.	*Days.*	*Pounds.*
Birth to 100 lbs	25	0.705	137.72	3.18
100 to 200 lbs	20	1.745	57.05	3.62
200 to 300 lbs	15	1.720	58.33	4.35
300 to 400 lbs	10	1.816	53.2	4.50
400 to 500 lbs	5	1.694	60.8	4.97

The breaking of unruly horses, especially those from America, DARRAS (*Vie Agr. et Rurale, 7 (1917), No. 14, pp. 239–242, figs. 3*).—Many horses imported into France for war purposes are not properly broken and some are so vicious that they are of little or no use. A method is described for breaking such horses quickly and using them in various branches of the service. For this work a specially constructed box or stall is used which confines the animal and yet allows handling by the trainer without the necessity of employing undue force or brutality. The stall is figured and described in detail.

The practical utilization of the light horse, P. DIFFLOTH (*Vie Agr. et Rurale, 7 (1917), No. 14, pp. 233–235, figs. 4*).—The adaptability and value of the small horse in modern warfare are discussed.

How to select laying hens, O. B. KENT (*N. Y. State Col. Agr., Cornell Univ. Ext. Bul. 21 (1917), pp. 23–33, pls. 5, figs. 9*).—The author points out indications of laying condition in hens as shown by changes in fat, color, body shape, secondary sexual characters, plumage, and actions. Directions are given for culling flocks of hens on this basis.

Wing molt as an indication of production, O. B. KENT (*Cornell Countryman, 15 (1918), No. 4, pp. 192, 193, 212, figs. 3*).—A method is described of determining quite accurately by the primary wing feathers how long a fowl has been in molt. It has been found that the time that a fowl stops laying in the fall is closely related to her total egg production, and that a hen, especially a Leghorn, usually stops laying when she begins molting. The time of onset of molting thus furnishes a means for determining how many eggs a bird has laid.

Value of breeding from selected stock, H. M. LAMON (*Jour. Mass. Poultry Soc., 1 (1917), Nos. 2, pp. 15, 16; 3, p. 24; 4, pp. 30–32*).—This is a discussion of the selection of poultry for vigor and vitality and the value of breeding from selected stock. The author recommends that in breeding work (1) a detailed description of matings be kept, (2) every hen trap nested and every chick toe punched, banded, or marked in some way, (3) 2 or 3-year old hens used to breed from, as these lay larger eggs than pullets, and (4) chicks hatched in March and April. He maintains that healthy fowls and good incubation, brooding, feeding, and range are necessary for the successful production of high-class stock.

A fowl's breeding value, W. A. LIPPINCOTT (*Country Gent., 82 (1917), No. 52, pp. 10, 11, figs. 8*).—In a flock of a breed of chickens, some of whose distinguishing characteristics are dominant, there is always a chance that some such character as rose comb or silver or black color may be carried in an impure or heterozygous condition. The author outlines the method of testing indivi-

dual fowls for the purpose of discarding those heterozygous for the character in question.

Poultry culture (*Mass. Bd. Agr. Bul. 1, 5. ed. rev. (1917), pp. 159, pls. 14, figs. 6*).—This is the fifth edition, revised, of this treatise on the different phases of poultry culture in Massachusetts. A bibliography is appended and the bulletin indexed.

Poultry raising in Colorado, W. E. Vaplon et al. (*Denver, Colo.: State Bd. Immigr., [1917], pp. 16, fig. 1*).—A series of articles on poultry raising written by men of practical experience in the State for the information of prospective settlers.

Pets: Their history and care, L. S. Crandall (*New York: Henry Holt and Co., 1917, pp. XII+372, pls. 32*).—This work, which closely follows the title, was written by the assistant curator of birds, New York Zoological Park. It treats of mammals, birds, reptiles, and fishes that are or may be reared as pets.

Color inheritance in mammals.—II–V, S. Wright (*Jour. Heredity, 8 (1917), Nos. 8, pp. 373–378; 9, pp. 426–430; 10, pp. 473–475, 476–480*).—Four papers are presented.

II. *The mouse.*—In this paper a detailed analysis is given of the present state of knowledge of color inheritance in the mouse. A list is given of the seven sets of Mendelian allelomorphs that have been identified and of the three series of color variations that so far have been analyzed. These are classified according to their apparent physiological effects under the scheme already noted (E. S. R., 37, p. 866).

III. *The rat.*—This digest of data on the inheritance of color in rats consists in the main of an interpretation of the results of Castle's selection experiments with hooded rats (E. S. R., 27, p. 369).

The author concludes that genetic variations are occurring sufficiently often to give a basis for selection to an indefinite extent. "Under any interpretation, Castle's selection experiment demonstrates the efficacy of Darwinian selection. It is true that one large mutation occurred with effects perhaps as large by itself as the entire plus selection series, but where such a variation gives one new level selection has produced a continuous series of stable levels. This would give selection of small variations a more important place in evolution and animal husbandry, where it is nice adjustments of one character to another or to the environment that count."

IV. *The rabbit.*—The author lists the ten unit differences known to be involved in the inheritance of color in rabbits. These are classified into seven independent sets of allelomorphs, three of which have been proved to be triple allelomorphs. These three sets of allelomorphs, as in the case of several other mammals, determine linear series of physiological effects not to be explained as linkage of factors in the germ cells.

V. *The guinea pig.*—In this brief discussion it is noted that "coat pattern in guinea pigs, and doubtless other animals as well, must be determined by a complex of causes of very diverse kinds. There are hereditary factors of various sorts and factors which are of the nature of accidents in development. There are factors which affect the extent of pattern and others which determine its localization. Of the latter some relate the pattern to the axis of symmetry and organs of the body, while others are random in their incidence. Some factors affect only the tortoise pattern in one way or another, or only the piebald pattern, while others have a simultaneous influence on both. The result is such a diversity of pattern among tricolors that a rough sketch will identify almost any animal in a stock of a thousand."

DAIRY FARMING—DAIRYING.

The agricultural situation for 1918.—II, Dairying.—Dairy production should be maintained (*U. S. Dept. Agr., Office Sec. Circ. 85 (1918), pp. 24, figs. 11*).—This article, one of the series prepared by the Department in the effort to increase the food production of the Nation in the present crisis, relates to the importance of proper maintenance of dairy production. The subject is treated under the headings importance of dairying, exports increase and imports decrease, food value of milk not fully appreciated, the dairy cow an economical producer of animal food, some advantages of dairying, how to increase production, economical feeding makes for profits, better utilization of dairy products, the war's effect on the world's supply of dairy cattle, duties of dairymen, and increased production through reduction of disease.

The relation of size of dairy to economy of milk production, J. A. HOPKINS, JR. (*Delaware Sta. Bul. 118 (1918), pp. 3–50, figs. 2*).—The study here reported was made to determine the correlation between the size of dairies operating under given conditions and their profitableness as indicated by profit per cow per year, cost per quart of milk, and profit per quart. The investigation was conducted during 1916 and involved 87 dairies in northern Delaware and southeastern Pennsylvania. As a method of comparison these dairies were divided according to size into nine classes which varied from dairies of less than 10 cows in class 1 to those of from 75 to 100 cows in class 9. Data for each of the classes are tabulated and discussed in detail.

The following table gives some of the results obtained:

Effect of size of dairies on cost of milk production.

Number of cows in dairies.	Number of herds.	Average annual production per cow.	Cost of feed and pasturage per cow.	Cost of labor per cow.	Total expense per cow.	Cost per quart of milk.		Price received per quart of milk.
						Lowest.	Average.	
		Quarts.				Cents.	Cents.	Cents.
Under 10	10	2,044	$92.23	$27.46	$163.91	5.8	7.70	5.2
10–14	11	1,873	94.48	19.20	158.36	5.6	8.40	4.4
15–19	10	2,326	81.39	25.82	151.79	3.9	6.35	4.6
20–24	11	2,375	86.88	23.54	159.40	4.6	6.50	5.3
25–29	9	2,935	90.20	27.23	167.52	4.0	5.50	5.7
30–39	10	2,939	81.78	22.71	145.18	3.4	5.20	4.9
40–49	8	2,891	80.35	23.03	150.43	3.6	4.70	4.6
50–74	8	3,018	90.81	24.28	164.80	3.8	5.20	5.2
75–100	9	3,475	97.57	48.96	218.44	3.7	5.90	7.2

The superior productiveness of larger dairies was found to be caused, in part at least, by the better type of cows which they kept. The cost per cow for hauling milk decreased as the size of the dairy increased up to 40 cows; then increased slightly as the addition of another horse became necessary; then decreased again as the size of the dairy increased. Cost of bull service per cow decreased as size of dairy increased up to 40 cows, then increased slightly as a second bull was added, and increased again as a third bull was added in dairies of over 80 cows. Cost of supervision increased slightly with the size of dairy. However, this added expense was more than offset by greater intelligence of management. The larger dairies produced a higher grade of product than the smaller ones and disposed of it at a higher and better price.

The management of dairy herds, E. V. ELLINGTON (*Idaho Sta. Bul. 102 (1917), pp. 3–40, pl. 1*).—This bulletin is a general discussion of the oppor-

tunities for dairying in Idaho, the breeds of dairy cattle, community breeding, selection and management of the herd bull, feeding dairy cattle, silos and silage, other feeding stuffs, calf raising, dairy barns, and milking machines.

The cost of milk production in Massachusetts, W. H. BRONSON (*Mass. Agr. Col. Ext. Serv. Bul. 19 (1918), pp. 20, fig. 1*).—The records used in estimating the cost of milk production in Massachusetts are for the year ended April 30, 1917, and are based upon data obtained from 87 herds distributed in 10 counties in that State. The following results are shown:

Cost of milk production in Massachusetts with different grades of cows.

Items of cost.	Average for all grades.	Less than 5,501 lbs.	5,501 to 7,500 lbs.	More than 7,500 lbs.
Feed	$109.82	$100.45	$109.12	$120.11
Labor	53.10	42.06	50.41	69.98
Other costs	38.44	29.61	36.30	52.11
Total cost per cow	201.36	172.12	195.83	242.20
Net cost per cow	185.31	156.88	182.86	217.54
Net cost per quart	.0618	.0721	.0624	.0552

Dairying in Uruguay, A. ABELLA (*Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 5, pp. 629–637*).—This is a discussion of the dairy industry in Uruguay, including statistics of dairy cattle, milk consumption and price, and imports of dairy products, and an epitome of legislative measures for the sanitary control of milk supply of cities in Uruguay.

Experiments with artificial one-year pastures, A. V. DAVYDENKO (*Rostovo-Nakhichevan. na Donu Selsk. Khoz. Opytn. Sta. Biul. 102 (1916), pp. 84*).—Experiments carried on in 1911, 1914, and 1915 with milch cows on one-year pasture crops are reported. The aim was to investigate the nutritive value and digestibility of rye-cowpeas mixture, oats-cowpeas mixture, and early sorghum, and the influence of these mixtures on the production and composition of milk. The green fodder mixtures were fed to one lot of cows each on pasture and in the stable. As a control one lot of cows was fed in the stable and on dry lot a ration of bran and straw, hay, and silage.

The coefficients of digestibility of the fodder mixtures are given in the following table:

Coefficients of digestibility of green fodder mixtures.

Kind of fodder.	Dry matter.	Organic matter.	Protein.	Fat.	Cellulose.	Nitrogen-free extract.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Rye-cowpeas mixture	70.27	73.28	70.24	79.66	74.28	70.60
Oats-cowpeas mixture	66.76	69.23	69.23	69.06	58.13	72.43
Sorghum	67.02	70.29	64.43	78.53	66.41	72.79

The results obtained in 1915 indicated that the green fodder mixtures had no specific effect on the quantity or quality of the milk. The pasture mixtures furnished the cows sufficient nutritive substances for their needs. On green fodder the cows gave more milk and fat on pasture than in the stable. This increased productivity of the cows on pasture may be explained by a greater amount of nutritive substances obtained in the fodder brought about by an increase of appetite as a result of exercise in the open. The pasture mixtures

had no bad effect on the general condition of the cows, nor was there any perceptible decrease in their live weight.

Mineral metabolism of the milch cow, E. B. Forbes (*Mo. Bul. Ohio Sta., 3 (1918), No. 1, pp. 8–10*).—A brief report is made of results secured in the third experiment of this series of studies (E. S. R., 37, p. 169), together with suggestions to dairy farmers upon the importance of legumes in feeding for heavy milk production.

The rations used in this experiment consisted of alfalfa as a sole roughage, with corn, cottonseed meal, linseed meal, and wheat bran. In certain periods the rations were supplemented by large amounts of calcium lactate, calcium chlorid, and precipitated bone flour. The cows almost invariably gave off more calcium, magnesium, and phosphorus in milk and excreta than was consumed in the feed. It was impossible by any of the means employed to prevent entirely this loss of minerals.

Results of investigations upon the causes of the limited capacities of cows to utilize mineral nutrients indicate that this was not due to lack of proper proportion among these nutrients, nor to deficiency of common salt, from which is formed the hydrochloric acid of the gastric juice, nor to difficult solubility of the supplements used, since even the water-soluble calcium lactate and calcium chlorid were poorly utilized. The limiting factor, it is thought, is in the process of assimilation of the mineral nutrients by the bones.

"It is true that most of the losses of minerals observed were small in comparison with the extent of the cow's mineral stores; and that these overdrafts would doubtless be repaid later in the period of lactation when the milk flow, and therefore the draft upon the mineral reserves of the skeleton would have become sufficiently reduced, provided the conditions of feeding were favorable. Still the facts as demonstrated are considered to be practically significant in relation to the frequent failure of heavy-milking cows to breed, to the shrinkage of milk production coincident with advance in the period of lactation, and to malnutrition of the bones.

"Among other facts of general significance which were observed was the lack of a close relation between the nitrogen of the body and the minerals of the bones in their metabolism. Bone starvation may proceed for some time before it seriously affects the gross body metabolism. In general it appears that the character of the body metabolism is highly variable; the organism does not gain and lose in each of its constituents at proportional rates, but rather it exhibits a remarkable degree of metabolic adaptability."

Simple problems concerning the fat secretion of milk glands, H. Isaachsen (*Norsk Vet. Tidsskr., 29 (1917), No. 6, pp. 165–178, figs. 7*).—In experiments here reported, involving four cows, one cow was slaughtered before milking, another after milk had been abstracted by means of a catheter, the third after having been partly milked, and the fourth after having been milked dry. Samples of the milk glands were taken immediately after slaughtering for microscopic examination. In the living cows part of the milk gland was removed by harpooning.

Microscopic examination showed that the milk glands from cows that were not milked or which had only been tapped for samples contained large, extended alveoli and alveolar ducts. The epithelial cells were full of fat drops. In samples of milk glands from cows that were milked dry, showing many smaller alveoli, the alveolar ducts were much broader and there were no fat drops in the epithelial cells. Milk glands from cows milked half dry showed smaller alveoli, and the fat content of the epithelial cells was less than of those from cows which had not been milked.

The results indicate that the stimulation necessary for normal milk secretion is of varied origin, and that the irritation produced by the hand and by the calf's sucking causes a change in the composition of the milk. Hand milking appears to be more stimulating to milk secretion than machine milking. It is noted that the leucocytes increase in the milk during milking.

Gradual conversion of colostrum into normal milk (*Österr. Molk. Ztg., 24 (1917), No. 14, p. 129; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 10, pp. 1378, 1379*).—A series of analyses of the colostrum of milch cows was made at the Station for Milk Control at Memmingen, Bavaria, during 1916. Some of the results of these analyses are given in the following table:

Results of analyses of colostrum.

Age of colostrum.	Sp. gr. at 15° C.	Fat content.	Dry matter.	Solids-not-fat.	Acidity (H_2SO_4).	Refractive index.
Days.		*Per cent.*	*Per cent.*	*Per cent.*		
½	1.0745	5.60	25.60	20.00	13.60	....
1	1.0392	3.80	14.62	10.82	9.20	....
1½	1.0350	4.20	14.05	9.85	11.20	39.2
2	1.0341	3.70	13.22	9.52	10.00	39.0
3	1.0333	3.60	12.90	9.30	9.20	39.0
4	1.0323	3.60	12.65	9.05	8.40	39.0
5	1.0321	3.80	12.84	9.04	8.40	39.2
6	1.0321	3.65	12.66	9.01	8.20	39.7
7	1.0312	3.70	12.50	8.80	8.00	39.6
8	1.0316	3.63	12.51	8.88	8.00	39.4
9	1.0329	3.73	12.95	9.22	8.00	40.6
10	1.0316	3.70	12.60	8.90	7.20	39.7
11	1.0322	3.58	12.60	9.02	7.20	40.8

The results indicate that, while milk may become practically normal as early as the fifth day, the acidity only becomes normal on the tenth. The relation between casein and albumin and the results of fermentation experiments indicate that the milk is not capable of caseification before the tenth day. Until the fourteenth day milk that is not fresh adheres to cooking vessels and acquires a burnt flavor.

The analysis of milk secreted by a suckling doe kid, R. L. Hill (*Jour. Biol. Chem., 33 (1918), No. 3, pp. 391–393*).—The author, at the Maryland Experiment Station, reports chemical analyses of milk secreted spontaneously by a 4-months-old virgin doe kid.

The milk had the characteristics, properties, and chemical composition of the milk secreted by the kid's mother and other goats. Since no colostrum was secreted, the inference is that the "secretion of colostrum is associated with and possibly is produced by the cessation of pregnancy, and may not occur in lactation not associated with pregnancy."

Report of the Mayor's Committee on Milk, City of New York, 1917, C. E. North (*Town* [*Baltimore*], *3 (1918), No. 19, Sup., pp. 2–6*).—This article contains extracts from the report of the committee on milk. The conclusions from the report are as follows:

"(1) Milk is the most valuable and the cheapest of human foods, even at present prices. (2) For drinking purposes New York City now uses only about 700,000 qts. daily. The city should use about 2,000,000 qts. daily for drinking in an ideal diet. (3) The cost of milk production at present prices is 7 cts. per quart, and the prices asked by the Dairymen's League are justified. (4) The cost of distribution, as shown by the dealers' accounts, is justified, and not large enough to prevent business losses. (5) The cost of production can

be reduced by (a) eliminating low-producing cows, (b) collective hauling of milk, (c) collective buying of grain. (6) The cost of distribution can be reduced by abolishing competition and duplication through centralizing the distributing system into a single company or public-service corporation."

Inspection and sanitation of dairies, J. O. LaBach and N. M. Cregor (*Kentucky Sta. Bul. 211 (1917), pp. 211–228*).—The first part of this bulletin contains notes on the inspection and sanitation of dairies and a reprint of the report of the committee on rules and regulations of the International Association of Dairy and Milk Inspectors on standards necessary for securing a clean and safe milk supply. Part 2, by N. M. Cregor, outlines the scope and use of the dairy score card and gives tabulated results of inspection of the dairies of the State.

Dairy Bacteriology.—I, Bacteriology of milk, W. Stevenson (*Trans. Highland and Agr. Soc. Scot., 5. ser., 29 (1917), pp. 153–181*).—This article treats in a popular way of the bacteriology of milk and briefly describes a few of the more common species of each of the main groups of bacteria ordinarily found in milk, indicating the main characteristics of each, the effects produced, and the usual sources of infection. Simple directions are given for the control of bacterial growth in milk and for dealing with faults in milk.

Investigation of conditions affecting the content of water in butter, with the use of various types of churns, L. F. Rosengren (*K. Landtbr. Akad. Handl. och Tidskr., 55 (1916), No. 4, pp. 249–263*).—This is a comparison of various types of churns and of the influence of salt on the water content of butter.

It is noted that if the water content is too large the butter must be reworked. Reworking decreases the water content of salted butter, but not of sweet unsalted butter. The working of butter without washing reduces the percentage of water. Washing decreases the water content of sweet cream butter, but it does not change the water content of sour cream butter.

Varieties of cheese: Descriptions and analyses, C. F. Doane and H. W. Lawson (*U. S. Dept. Agr. Bul. 608 (1918), pp. 80*).—This is a revision of a bulletin previously noted (E. S. R., 27, p. 75). A few additional varieties of cheese have been included, and notes are given on the manufacture of domestic varieties of European cheese in the United States.

VETERINARY MEDICINE.

[Live stock diseases], G. C. Humphrey (In *The Rural Efficiency Guide.—IV. Stock Book. Cleveland, Ohio: The Peoples Efficiency Publishing Co., 1918, pp. 62–100, 139–181, 200–212, 234–272, 328–355, 376–380, 394, 402, figs. 52*).—In this volume the diseases of cattle (pp. 62–100), of horses (pp. 139–181), of sheep (pp. 200–212), of swine (pp. 234–272), and of poultry (pp. 328–355, 376–380, 394, 402), are dealt with.

A practical textbook of infection, immunity, and specific therapy, with special reference to immunologic technique, J. A. Kolmer (*Philadelphia and London: W. B. Saunders Co., 1917, 2. ed. rev., pp. XIII+978, pls. 35, figs. 104*).—A thoroughly revised edition of the work previously noted (E. S. R., 33, p. 476).

Veterinary surgical operations, L. A. Merillat (*Chicago: Alexander Eger, 1918, 2. ed., rev. and enl., pp. 556, pls. 4, figs. 281*).—A textbook for the student and practitioner of veterinary medicine.

Report of the bureau of animal industry [New Jersey], J. H. McNeil (*N. J. Dept. Agr. Bul. 9 (1917), pp. 308–311*).—A brief report on the occurrence of and work with the more important infectious diseases of the year.

Veterinary division, annual report, 1915–16, C. E. Gray (*Union So. Africa Dept. Agr. Rpt. 1916, pp. 27–38*).—The usual report of the occurrence of and work with the more important infectious diseases of live stock during the year.

The chemical investigation of some poisonous plants in the natural order Solanaceæ.—III, The occurrence of nor-hyoscyamine in Solandra longiflora, J. M. Petrie (*Proc. Linn. Soc. N. S. Wales, 41 (1917), No. 164, pp. 815–822*).—The leaves of *S. longiflora* were found to contain nor-hyoscyamine as the chief alkaloid, this alkaloid having been isolated and described by the author in 1907 under the name "solandrine." Solandra also contains hyoscyamine in lesser amount, but scopolamines are absent. The total amount of alkaloid obtained was 0.17 per cent in the leaves (dried at 100° C.).

A discussion of some principles of anthelmintic medication, M. C. Hall (*New Orleans Med. and Surg. Jour., 70 (1918), No. 8, pp. 637–653*).—A general discussion of this subject.

Some new antiseptics and disinfectants, N. S. Mayo (*Amer. Jour. Vet. Med., 13 (1918), No. 3, pp. 111–115*).—Dakin's solution, chlorazene, and dichloramin-T are considered as to composition, preparation, use, and applications in veterinary surgery and practice. Cases are reported of the successful use of chlorazene for intravenous injections in cases of septicemia and contagious abortion, and of dichloramin-T in the treatment of fistulous withers.

"X-acid" as a remedy in polyneuritis and beriberi, D. J. Hulshoff (*Jour. Physiol., 51 (1917), No. 6, pp. 432–439*).—An experiment reported by the author indicates that 1 gm. of dry extract, prepared from katjang hidjoe (*Phaseolus radiatus*) and dissolved in water, suffices to cure polyneuritis gallinarum. "Administration of the dry extract dissolved in a small quantity of water gives better results than administration of the decoction since the disadvantages attached to passing large quantities of fluid into the crop are avoided."

An experimental investigation of lipovaccines, E. R. Whitmore and E. A. Fennel (*Jour. Amer. Med. Assoc., 70 (1918), No. 13, pp. 902–904*).—Continuing the work previously reported (E. S. R., 38, p. 584), the authors report that "the lipovaccines can be made on a large scale by growing the bacteria in Kolle flasks, taking off the growth with a vacuum scraper, freezing and drying in vacuo, and emulsifying in lanolin and oil by grinding in a ball mill, using glass bottles and steel balls. The oils can be sterilized by steam at 15 lbs. for 15 minutes, by heating to 90° C. for 10 hours on a water bath, or by mixing with potassium iodid."

The preparation of Dakin's solution and the Carrel technique in the treatment of infected wounds, W. N. McDonell (*U. S. Naval Med. Bul., 12 (1918), No. 1, pp. 45–53, fig. 1*).—Details are given of the preparation of this solution, which, it is pointed out, may be satisfactorily prepared in several ways.

Studies on the cicatrization of wounds, Tuffier and Desmarres (*Compt. Rend. Acad. Sci. [Paris], 166 (1918), No. 5, pp. 230–232*).—Observations of various processes for hastening the healing of wounds have led to the following conclusions:

A simple dry, sterile, and absorbent dressing applied to a sterile wound produces a slightly more rapid cicatrization than Dakin's solution. Alternating aseptic dressings following the cycle of sodium hypochlorite, physiological serum, boiled water, and dry dressing, increases only slightly the rate of healing. Heliotherapy associated either with hypochlorite or a dressing of neutral substances, such as zinc oxid or bismuth subgallate, gives excellent results.

Note on an apparatus for counting and identifying the organisms of surface wounds and of the skin, Grysez (*Compt. Rend. Soc. Biol. [Paris], 80 (1917), No. 15, pp. 736, 737, figs. 2*).—The apparatus consists of a layer of agar

2 mm. thick fastened aseptically on the outer wall of a test tube. The cylinder of nutritive material can be rolled over the wound or skin to be examined and the organisms thus fixed on the surface grown, counted, and identified.

The technique of the preparation of the cylinder is described.

Ptomaines and war wounds, A. BERTHELOT (*Compt. Rend. Acad. Sci. [Paris], 166 (1918), No. 4, pp. 187–189*).—The author suggests the possibility that the formation of ptomaines in war wounds may be one of the causes of auto-intoxication which aggravates the condition of certain severe wounds. In verifying this hypothesis he has shown by test-tube experiments that toxic ptomaines, particularly imidazoethylamin, may be formed by the action on the blood of proteolytic and decarboxylating organisms present in war wounds.

The hematoxin of Bacillus welchii (B. perfringens), A. OURANOFF (*Compt. Rend. Soc. Biol. [Paris], 80 (1917), No. 15, pp. 706–708; abs. in Chem. Abs., 12 (1918), No. 1, pp. 63, 64*).—The following conclusions are drawn from a study of several strains of *B. welchii:*

Strains of *B. welchii* isolated from different wound infections have the property of secreting a hematoxin which acts upon the erythrocytes of various animals. The faculty of producing hematoxin is characteristic of the strains of *B. welchii* in different degrees. The same strain can temporarily lose its faculty of producing hematoxin and recover it later. The hematoxin is destroyed by heating for half an hour at 60° C. and by keeping in strong light for several days, but it may be kept for several months at a temperature of 14 to 15° or at a temperature near zero. On filtering through Chamberland or Berkefeld filters a part of the hematoxin remains on the filter.

Phenomena of hemoglobinuria have been observed in rabbits and young dogs which have died following injection of *B. welchii* hematoxin, thus proving the intravital destruction of erythrocytes by this toxin. The serum of the animals studied (man, pig, dog, horse, cow, sheep, guinea pig, rabbit, and chicken) diminishes the action of the hematoxin. Prolonged hyperimmunity in horses by cultures of *B. welchii* increases considerably the action of serum on the hematoxin, showing that the production of antihematoxin becomes more intense under the influence of the introduction of *B. welchii* into the organism. Increase in antihemolytic titer toward the hematoxin of *B. welchii* is not observed in the serum of horses hyperimmunized by the organisms of putrefaction (*B. proteus vulgari* and *B. sporogenes*). During filtration through Chamberland filters of the serum of normal horses and those hyperimmunized by cultures of *B. welchii*, a large part of the antihematoxin remains on the filter. Cultures of *B. welchii* devoid for various reasons of hemolytic properties often present the phenomena of hemagglutination.

The developmental cycle of the Bothriocephalus latus, C. JANICKI and F. ROSEN (*Corresp. Bl. Schweiz. Ärzte, 47 (1917). No. 45, pp. 1505–1516; abs. in Jour. Amer. Med. Assoc., 69 (1917), No. 26, p. 2212*).—In work at the laboratories of the universities of Lausanne and Neuchâtel the authors found that the larvæ of (*B.*) *Dibothriocephalus latus* are ingested by *Cyclops strenuus* and *Diaptomus gracilis*, which are eaten by fish, and thus the parasite finds its way to man, dog, and cat. Each of the five phases of the cycle may take from three to four weeks.

Wohlfartia magnifica, a sarcophagid parasitizing man, L. GOUGH (*Bul. Soc. Ent. Egypte, 10 (1917), No. 1, pp. 23–25*).—The author records the collection of *W. magnifica* from the orbits and from ulcers behind the ears of patients in the ophthalmic hospitals at Sheybeen-el-Koom, Kafr-el-Dawar, Zagazeeg, Mahalla-el-Koubra, and Damanhoor.

A new genus of blood parasites, F. Martoglio (*Ann. Ig.* [*Rome*], *27* (*1917*), *No. 9, pp. 561–563, pl. 1*).—The genus Hæmotrichomonas is erected for *H. ophidium* and *H. gallinarum*.

[Anthrax and disinfection of hides] (*Jour. Amer. Leather Chem. Assoc.*, *12* (*1917*), *No. 8, pp. 374–400, 408–424*).—Papers are here presented by A. S. Ross on Anthrax (pp. 374–381); by H. J. Frisbie on the Practice and Theory on Treatment and Diagnosis of Anthrax (pp. 381–384). by A. P. Hitchens on the Nature of Anthrax and Antianthrax Serum (pp. 384–388); by V. A. Wallin on Anthrax and Hide Disinfection (pp. 396–400); and by C. L. Peck on the Treatment of Tannery Sewage (pp. 422–424). Discussions by Buswell and others of disinfection of tannery sewage by means of chlorin (pp. 389–395) and of anthrax by R. W. Hickman, Dorset, and others (pp. 408–421) are also presented.

Foot-and-mouth disease in Sweden in 1914–15, G. Kjerrulf (*Meddel. K. Med. Styr.* [*Sweden*], *No. 26* (*1916*), *pp. 143, pls. 2, figs. 3*).—This report deals particularly with the sanitary police measures adopted in combating foot-and-mouth disease in Sweden.

Glanders in Brazil.—Observations made on a tour of investigation, J. B. Mendy (*An. Soc. Rural Argentina, 51* (*1917*), *No. 3, pp. 254–261, figs. 12*).—This article summarizes the possible means of spreading glanders by contaminated drinking troughs, feed, bridles and equipment, public grazing ground, etc. An examination of all the horses and mules in the First Cavalry and Second Artillery during an epidemic of glanders showed that all the horses either had the disease as recognized by clinical symptoms or reacted positively to the mallein test. Observation cases are cited of glanders in man and of the mallein test in experimental rabbits and in horses having the disease.

The serum treatment of hemorrhagic septicemia, W. B. Mack and E. Records (*Jour. Amer. Vet. Med. Assoc., 52* (*1918*), *No. 7, pp. 810–819*).—This is a detailed account of the serum treatment of the cattle disease previously noted (E. S. R., 38, p. 487).

The serum was prepared by injecting horses with increasing doses of living cultures of *Bacterium bovisepticum* isolated from cattle until their serum reached such a potency that 5 mils given intravenously would protect a rabbit against approximately 1,000 fatal doses of the organism given subcutaneously at the same time. Of 140 cases receiving the treatment 60 died and 80 recovered, giving a mortality of 43 per cent as against over 95 per cent in untreated cases.

Factors apparently affecting the percentage of recoveries after vaccination are as follows: (1) Previous vaccination: Animals previously vaccinated have apparently an 11 per cent better chance of recovery. The vaccine consisted of a 48-hour bouillon culture of mixed strains of *B. bovisepticum* killed by the addition of 1 per cent phenol and used in a dose of 5 mils. This was followed in from 10 to 14 days by a 2-mils dose of a 48-hour bouillon culture of a strain of *B. bovisepticum* which had lost its virulence for cows. (2) Apparent severity of attack as judged by clinical symptoms: There is apparently no relation between the severity of symptoms and chances for recovery. A moderate delay in the administration of serum does not seem to greatly reduce the chances for recovery provided it is administered before the animal passes into the final stage of collapse. (3) Amount of serum administered: Tabulated results of varying amounts from 30 up to 1,000 mils seem to show that doses in excess of 200 mils are of little value.

The authors feel that the results obtained by the use of serum therapeutically may not be due to specific action, and that possibly nonspecific and even normal serum would produce as good results.

The curative treatment of epizootic lymphangitis by vaccinotherapy, VELU (*Bul. Soc. Cent. Méd. Vét., 93 (1917), No. 9–10, pp. 195–204; abs. in Jour. Amer. Vet. Med. Assoc., 52 (1917), No. 2, pp. 134–136*).—The author presents the details of eight cases treated by a polyvalent anticryptococcic pyovaccine and summarizes his observations as follows:

After the first injection of the vaccine the negative stage is immediate; it lasts from 2 to 5 days, according to the dose given. The following positive stage is longer, varies with the dose injected up to 10 days, and lasts on an average from 5 to 6 days. After the end of the positive stage, the disease resumes its normal course, about 5 to 15 days after the injection of the vaccine.

A second injection, made during the negative stage, gives rise to a lasting aggravation of the disease. When made at the end of the positive stage it is followed by the appearance of phenomena absolutely identical to those that follow the initial injection. When made at the proper time, before the end of the positive stage, the negative phase is less severe; it appears later, toward the second or third day, does not last so long as after the first injection, and even after the third or fourth injections there is only a retarded progress in the recovery. The best time for renewing the injections is when the positive stage is at its height.

The formation of lasting or only predominating positive stages allows the complete cicatrization of the abscesses in 20 to 30 days after they are punctured, providing the puncture has been made after the first injection. The doses, which give rise to severe positive stages, vary with the individual susceptibility and the degree of acuteness of the affection. A strong dose produces a severe negative stage sometimes without a positive stage. Too weak a dose gives a slight negative stage and a short and slightly confused positive one.

"Improvement of the lesions and their rapid cicatrization require constant watching. Interference brings an aggravation of the disease. It is absolutely necessary to open very freely and thoroughly all the abscesses and surrounding tissues as soon as the pus is well formed. Abscesses which have culs-de-sac, fistulous tracts, or those with pale, old granulations do not progress toward rapid cicatrization. Injections must be continued until complete recovery, even when a positive, well-marked stage seems to show it. The local treatment, besides the early punctures, must consist of only ordinary antiseptics without washing and needs to be renewed only every 3 or 4 days. In some cases the cryptococci disappear from the pus before the complete repair of the lesions, and then there is general sterilization of the organs before the final cicatrization."

Report on ixodic lymphangitis, E. M. JARVIS (*Vet. Jour., 74 (1918), No. 512, pp. 44–53*).—This disease, or tick pyemia, is defined as "an inoculable disease originating in primary causes through the agency of Amblyomma ticks as mechanical carriers. The infective organisms are of telluric origin, and the invasion is usually of mixed microorganisms. The disease is usually characterized by suppuration, ulceration, and necrosis."

The article discusses the disease from the point of view of its history, geographical distribution, etiology, clinical symptoms, dissemination of the virus, and surgical, antiseptic, medicinal, and prophylactic treatment.

The bacteriotherapeutic treatment of ulcerous lymphangitis, C. TRUCHE (*Ann. Inst. Pasteur, 31 (1917), No. 5, pp. 209–214*).—Noted from another source (E. S. R., 37, p. 583).

The vitality of the rinderpest virus outside the animal body under natural conditions, A. W. SHILSTON (*Mem. Dept. Agr. India, Vet. Ser., 3 (1917), No. 1, pp. 32, pls. 4*).—"The length of time that the rinderpest virus is able to survive in blood from a sick animal kept at air temperature in an open vessel varies within wide limits; in one observation such blood was noninfective after three

days' exposure, while in another it remained infective for 51 days, although putrefaction set in after a few days' exposure, and by the thirtieth day the blood was completely desiccated. In two other observations blood was still infective after nine days' exposure to the air, and in a third it was infective after seven days' but noninfective after nine days' exposure. In two observations the virus maintained its vitality in bone marrow for nine days, but in one of these cases infectiveness was lost after 15 days. Meat was infective after three days in one observation when blood from the same animal was noninfective within that period; in another case meat remained infective for five days.

"Further tests are necessary to determine the factors influencing the survival of the rinderpest virus in animal tissues under natural conditions. The temperature at which the material is kept appears to have a considerable effect, possibly in determining the rate and character of the putrefactive changes taking place, but it has been shown that these may not destroy the virus as rapidly as many authorities have stated to be the case."

A new method for the separation of toxins, particularly tetanus toxin, E. S. London and V. M. Aristovsky (*Compt. Rend. Soc. Biol. [Paris], 80 (1917), No. 15, pp. 756–758; abs. in Chem. Abs., 12 (1918), No. 1, pp. 43, 44*).—The method is called a method of specific coagulation by ions, and depends upon the specific property of the tetanus toxin of diminishing the surface tension of the colloidal particles of culture bouillon and precipitating itself on the surface of those particles whose surface tension corresponds to the distension of the toxin itself. By selecting an electrolytic substance whose ions are capable of exercising a pressure on the surface of the particles charged with the toxin, a coagulation can be formed containing the toxin.

The method employed for tetanus toxin consists of first adding to the culture bouillon ammonium sulphate in a concentration of 17 gm. per 100, centrifuging, and rejecting the precipitate. On addition to the filtrate of ammonium sulphate (1 to 3 gm. per 100), the precipitate which forms contains the toxin. The toxic coagulum dried in a vacuum is dissolved and reprecipitated by ammonium sulphate of the right strength until animal tests show that further purification will not increase the toxicity of the preparation.

This method should be considered only as a scheme which must be modified each time, depending upon the quality of the substances used in the preparation of the bouillon, the toxicity of the cultures, etc., but it is the opinion of the authors that it is a method of general application in the preparation of toxins and ferments.

An antigen for use in complement fixation in tuberculosis, M. S. Fleisher and G. Ives (*Jour. Lab. and Clin. Med., 3 (1918), No. 5, pp. 302–305*).—The antigen described is prepared as follows:

Tubercle bacilli from a number of different strains are isolated from sputum and grown on Petroff's medium for six or eight weeks. The organisms are then transferred to a sterile open Petri dish, dried overnight in an incubator at 37° C., transferred to a sterile mortar, and ground thoroughly for three or four hours with the addition of a small amount of distilled water. Sufficient 0.85 per cent sodium chlorid is then gradually added to make a 0.5 per cent suspension of bacteria, the grinding being continued until the bacteria form an even suspension. Finally enough of 5 per cent carbolic acid is added to equal one-tenth the volume of the sodium chlorid solution.

The antigen is considered to be a suspension and a watery extract of tubercle bacilli, both of which have the power of fixing complement in the presence of the sera of tuberculous individuals. The entire antigen is stronger than either the fluid or the suspended matter alone. From results obtained with the

antigen, the authors believe that it is the equal of any of the antigens proposed by others and that it has the advantage of being sterile and stable, and possibly more sensitive.

Vesicular stomatitis of horses and cattle, J. R. Mohler (*Jour. Amer. Vet. Med. Assoc., 52 (1918), No. 4, pp. 410–422*).—This paper, presented at the 1917 meeting of the American Veterinary Medical Association, at Kansas City, Mo., includes later data than those previously noted (E. S. R., 37, p. 81).

Researches upon abortion of cattle, W. L. Williams (*Rpt. N. Y. State Vet. Col., 1915–16, pp. 117–198, figs. 9*).—In this discussion, which is in continuation of reports previously noted (E. S. R., 38, p. 183), the author considers the avenue and date of intrauterine infection, the immunity of contagious abortion, researches in a large dairy herd, the influence of copulation and other agencies upon the agglutinating power of the blood, and diseases of newborn calves. An outline of recommendations for control is included.

A preliminary study of the pathology and bacteriology of ovaritis in cattle, C. P. Fitch (*Rpt. N. Y. State Vet. Col., 1915–16, pp. 199–208*).—This is a preliminary report of investigations under way which have led the author to consider the following tentative conclusions justified:

"Cystic degeneration of the ovaries of cattle is common. The character of the cysts is often simple, but cystic corpora lutea or 'hemorrhagic cysts' are found. Adenocystoma and papillomatous and carcinomatous cysts are relatively uncommon. Cultures made from cystic ovaries of cattle show a variety of organisms to be associated with this condition."

The vaccine treatment of Texas fever, R. L. Rhea (*Vet. Notes, 11 (1917), No. 1, p. 3*).—The successful treatment of two cases of Texas fever by the use of a combined streptococcus and staphylococcus vaccine is recorded by the author.

The etiology and mode of infection in white scours of calves, W. A. Hagan (*Cornell Vet., 7 (1917), No. 4, pp. 263–283*).—A summary of the present status of knowledge of this disease.

Investigations have shown that "a large percentage of calves are born with infected meconium. *Bacillus coli* and certain cocci are the organisms found. The same organisms are found in the fetal fluids and utero-chorionic space in the sealed uteri of apparently normal cows. The utero-chorionic space is first infected, followed by the fluids and lastly, the meconium. The infection reaches the meconium by swallowing of the amniotic fluid by the calf. The infection probably reaches the utero-chorionic space by passing through the cervix uteri from the vagina before the seal is formed, and persisting there throughout pregnancy.

"The infection frequently existing in the intestine of the unborn calf sometimes produces scouring before birth, but usually induces an acute toxic condition with diarrhea soon after birth. These diarrheic feces are highly virulent to other calves. Ordinary disinfection is insufficient to deal with this disease because of the number of calves born with the infection contained within them. These calves will develop the disease despite the most rigid disinfection of their surroundings and care used with their food."

Hog cholera in Argentina, F. Rosenbusch, J. Zabala, and R. González (*An. Soc. Rural Argentina, 51 (1917), No. 9, pp. 657–665, pls. 7, figs. 5*).—This is a discussion of the nature and occurrence of hog cholera in Argentina.

Trichinosis in Denmark, J. Fibiger (*Hospitalstid. [Copenhagen], 60 (1917), No. 42, pp. 1021–1048; abs. in Jour. Amer. Med. Assoc., 69 (1917), No. 26, p. 2212*).—The author points out that meat from a single hog infested with

trichinæ may start an epidemic such as occurred at Habersleben, where 337 persons were affected and 101 died.

Fern poisoning or fern staggers, B. T. Simms (*Oreg. Countryman, 10 (1917), No. 2, pp. 15, 33, 34*).—The author reports that a very heavy loss of horses in western Oregon extending over several months has resulted from fern poisoning. The cause appears to be the same as that described by Hadwen and Bruce in a report previously noted (E. S. R., 38, p. 589).

Insect transmission of infectious anemia of horses, C. W. Howard (*Jour. Parasitology, 4 (1917), No. 2, pp. 70–79*).—A brief discussion of swamp fever, including a review of previous investigations, followed by a report of experimental work conducted at the Minnesota Experiment Station. The results of the experiment indicate that the disease can be carried from one horse to another by the stable fly, but the author is not fully convinced that insects are the usual or only carriers of the disease.

The treatment of pneumonia by intratracheal injections, Chambers (*Vet. Jour., 73 (1917), No. 510, pp. 421–425*).—The author reports upon his experience in the treatment of pneumonia at a port of embarkation, which extended over a period of ten months.

He found a remarkable decrease in the mortality among horses to follow the routine procedure of giving an intratracheal injection of 10 cc. of a slightly warm solution of formalin in water or 10 cc. of creosote 1 part and 63 per cent alcohol 10 parts to every animal admitted to the port with catarrh or catarrhal fever. Over 400 cases of chest affections were treated by both, and while the two mixtures appear equally beneficial the author favors the use of creosote on account of its nonirritability. With the formalin solution one or two injections may be given daily but it is not advisable to make more than four or five consecutive injections, while with creosote four or more consecutive injections may be given without danger.

Fowl typhoid, Pfeiler and Roepke (*Centbl. Bakt.* [etc.], *1. Abt., Orig., 79 (1917), pp. 125–139; abs. in Jour. Compar. Path. and Ther., 30 (1917), No. 3, pp. 263–266*.—This is a report of studies of a disease identical with that first described by Pfeiler and Rehse in 1912 (E. S. R., 30, p. 385) as due to *Bacillus typhi gallinarum alcalifaciens*. The present paper deals mainly with the biochemical and agglutinating properties of this organism.

RURAL ENGINEERING.

Surface irrigation for eastern farms, F. W. Stanley (*U. S. Dept. Agr., Farmers' Bul. 899 (1917), pp. 35, figs. 21*).—This publication "discusses the so-called surface methods of irrigation and their possibilities for the farmer whose pocketbook, crops, and market facilities do not justify consideration of the other methods." Among the points discussed are the conditions adapted to surface irrigation, the amount of water needed in furrow irrigation, obtaining a water supply, conveying the water to the land, details of the pumping plant, distributing the water by terra cotta pipe systems, reinforced concrete, and sewer pipe, and applying the water to crops by the use of portable pipe and hose and furrow irrigation, and the cost of irrigation.

Artificial spray irrigation (*Tijdschr. Nederland. Heidemaat., 29 (1917), No. 7, pp. 193–210, pls. 2, figs. 2*).—This article gives data on the design, installation, operation, and cost of overhead irrigation systems.

The quantities of water and the frequency of irrigation as influenced by the physical properties of soil, A. Müntz and E. Lainé (*Bul. Soc. Encour. Indus. Nat.* [*Paris*], *116 (1917), I, No. 2, pp. 386–397; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 7, pp. 974–978*).—Further experiments (E. S. R., 32, p. 586) are reported on the relation between

permeability of soils and the amount and velocity of irrigation. Soils classed as impervious, slightly pervious, and pervious were used in the experiments. It is concluded that the module and width of irrigated plats should be such that the velocity of the irrigation water will be high for very pervious soils and low in relatively impervious soils.

A general conclusion from these studies is that a study of the physical properties of the soil to be irrigated should precede the design of an irrigation system.

Field studies of the influence of module, of quantity and distribution of irrigation, and of frequency of irrigation on harvest are also reported, the purpose being to show the proper procedure on soils in different parts of France.

Surface water supply of Missouri River Basin, 1915 (*U. S. Geol. Survey, Water-Supply Paper 406 (1917), pp. 282+XLI, pls. 2*).—This report, prepared in cooperation with the States of Colorado, Montana, Nebraska, and Wyoming, presents the results of measurements of flow made on the Missouri River and tributary basins during 1915. Additional sections are included on stream-gauging stations and a list of publications relating to water resources.

The oxygen-consuming power of natural waters, G. W. Heise and R. H. Aguilar (*Philippine Jour. Sci., Sect. A, 11 (1916), No. 1, pp. 37–47; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 11, pp. 1577–1579*).—In connection with quantitative studies on some of the factors influencing the determination of the oxygen-consuming capacity of natural waters by means of potassium permanganate in acid solution, it is concluded that the determination of oxygen consumption at best is not an accurate measure of the organic content of a water and that such uncertain results are obtained as to make isolated determinations of very little value. "It is only when a water supply is to be examined repeatedly that the determination becomes very useful."

Minnesota road laws, compiled by L. A. Smith (*Minneapolis: State, 1917, pp. 50*).—The text of the laws is given.

Annual report on highway improvement, Ontario, 1916, W. A. McLean (*Ann. Rpt. Highway Improv. Ontario, 1916, pp. 31, figs. 12*).—This is a brief report on highway improvement works and expenditures in Ontario, Canada, for 1916.

Paving economy: Road and street, C. A. Mullen (*Montreal: Indus. and Ed. Press, 1917, pp. 98, figs. 4*).—This book deals with the economics of design, construction, maintenance, and repair of pavements for roads and streets.

Report on experimental convict road camp, Fulton County, Ga., H. S. Fairbank, R. H. Eastham, and W. F. Draper (*U. S. Dept. Agr. Bul. 583 (1918), pp. 64, pls. 17, figs. 2*).—The operation of an experimental convict road camp, maintained for 10 months in Fulton County, Ga., is described. The camp was established as the result of the studies of convict labor for road work conducted in 1914 and 1915 by the Office of Public Roads and Rural Engineering and the Public Health Service, previously noted (E. S. R., 36, p. 386).

A special type of portable building, designed with a view to determining the practicability and economy of this type in comparison with other camp structures, is described. A balanced ration was installed to ascertain whether this diet and system would effect economy and promote the welfare of the convict. The honor system was followed in the discipline of the convicts, all of whom were negroes, and no attempts to escape were made.

Construction data on the cost of the various road projects are included, as well as cost data for the construction and maintenance of the camp. "Taken as a whole, the outstanding results of the experiment demonstrate that clean-

liness, comfort, and humanity in the convict camp are not inconsistent with economy and efficiency in the work of the inmates."

Progress reports of experiments in dust prevention and road preservation, 1916 (*U. S. Dept. Agr. Bul. 586 (1918), pp. 78*).—New experiments begun by the Office of Public Roads and Rural Engineering during the year 1916 are described. These included experiments on bituminous macadam and bituminous gravel construction on the Russel Road in Alexandria County, Va.; bituminous gravel concrete and earth-oil asphalt on the Alexandria-Accotink Road in Fairfax County, Va.; and the bituminous surface treatment of a new gravel road leading from Gum Spring to Mount Vernon in Fairfax County, Va. In addition special experiments with corrugated metal culverts were initiated on the Texas post road in Comal and Hays Counties, Tex.

Supplementary reports on experiments previously reported (E. S. R., 36, p. 188) are also included on bituminous macadam and bituminous concrete on Mount Vernon Avenue Road, Alexandria County, Va., 1915; bituminous surface treatment on Falls Road, Montgomery County, Md., 1915; bituminous macadam on Bradley Lane, Montgomery County, Md., 1915; bituminous concrete at Washington, D. C., 1915; oil asphalt-coralline rock at Buena Vista, Fla., 1915; oil asphalt-sand at Jupiter, Palm Beach County, Fla., 1915; bituminous sand and oil-limestone mixing methods at West Palm Beach, Fla., 1915; sand-asphalt at Ocala, Fla., 1915; oils, tar preparation, and calcium chlorid-coralline rock at Lemon City, Fla., 1914; oil, tar, and oil asphalt-coralline rock at West Palm Beach Fla., 1914; oil-coralline rock at Miami, Fla., 1913; bituminous surface treatment on Rockville Pike, Montgomery County, Md., 1913; tar preparation and oil surface treatment at Washington, D. C., 1912; bituminous concrete, cement concrete, oil cement concrete, vitrified brick, and bituminous surface treatment on concrete at Chevy Chase, Md., 1912; bituminous construction and surface treatment at Chevy Chase, Md., 1911; oil cement concrete, oil asphalt, and tar and fluxed native asphalt at Jamaica, N. Y., 1911; oil asphalt gravel at Ames, Iowa, 1910; tar and oil preparations at Knoxville, Tenn., 1910; slag, lime, waste sulphite liquor, and tar at Youngstown, Ohio, 1910; sand-clay at Dodge City, Garden City, Bucklin, and Ford, Kans., 1908; and Kentucky rock asphalt at Bowling Green, Ky., 1907.

Mechanical culture and draft animals, H. DE LAPPARENT (*Jour. Agr. Prat., n. ser., 30 (1917), No. 10, pp. 177, 178*).—Data from French sources are given on the cost of maintenance of horses, mules, and cattle as draft animals, it being shown that cattle can be maintained for about one-fourth the expense of horses and mules. The economic conclusion is drawn that the development of mechanical culture should involve the raising of cattle for draft animals, thus making a great reduction in the number of mules and horses actually needed, particularly in regions where the use of cattle as draft animals is not unusual.

Review of mechanical cultivation, M. RINGELMANN (*Bul. Soc. Encour. Indus. Nat. [Paris], 116 (1917), I, No. 2, pp. 399–418, figs. 7*).—This outlines the duties of the French Service for soil cultivation, reviews recent mechanical cultivation experiments in France, and describes French, English, and American mechanical cultivating machinery.

Tests of mechanical cultivation, J. DISSOUBRAY (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 37 (1916), Nos. 49, pp. 542–548; 50, pp. 561–563*).—Four days' plowing tests of five tractors on stony calcareous clay soil, tenacious calcareous clay, siliceous clay, and rocky calcareous clay soil are reported and discussed.

Tests of mechanical cultivation, E. ZACHAREWICZ (*Rap. Trav. Dir. Serv. Agr. [Dept. Vaucluse, France], 1915–16, pp. 186–199*).—Tests of six French tractors on deep and shallow plowing are reported.

Actual situation of motor cultivation in Department of Haute-Garonne [France], G. Héron (*Jour. Agr. Prat. Vit et Écon. Rurale Midi France, 112 (1916), No. 8–12, pp. 190–210*).—This is a discussion of the economics of motor cultivation in Department of Haute-Garonne, France.

Tests of motor cultivation at Périgueux, E. Béziat (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 38 (1917), No. 18, pp. 421–428. figs. 2*).—Tests of five American tractors on direct draft plowing under French conditions on February 22 and 23, 1917, are reported. All the tractors were of the two-drive wheel type and with either one or two guide wheels. Three bottom plows were used.

It is concluded that the American tractors are far from ideal for French use.

A study of the plow bottom and its action upon the furrow slice, E. A. White (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 4, pp. 149–182, pls. 4, figs. 26*).—This paper, contributed from the New York Cornell Experiment Station, "is an attempt to begin a fundamental analysis of the plow bottom and its work." It includes (1) a study of the forms of plow bottoms, (2) an attempt to analyze the motion of the soil particles as they pass over the surface, and (3) a mathematical analysis of the surfaces of the most important historical plow bottoms which were designed to be geometrically exact.

"There is considerable evidence, based upon field experience, which indicates that a portion of a hyperboloid of one sheet is the proper form for the surface of a plow bottom. So far as is known this hypothesis awaits definite proof."

Electricity on the farm, C. O. Crane (*Reclam. Rec. [U. S.], 8 (1917), No. 10, pp. 471–473, 476*).—This article deals with the economics of using electrical power for various farm and household operations, with special reference to conditions in southern Idaho. It is stated that under the prevailing rate of 6 cts. per kilowatt-hour for electrical power in southern Idaho, man power at 15 cts. an hour is about thirty-two times as expensive as electrical power. Considerable data are given on the electrical power requirements for various farm operations, including irrigation pumping and cost data therefor.

"There are now 1,770 rural customers using current for lighting residences and barns, 273 for domestic power, 312 for irrigation, 18 for grinding feed, 130 for cooking and water heating, 80 for washing machines, 1,220 for flatirons, and 1,060 for some of the other labor-saving domestic appliances."

Modern methods of lighting and ventilating cow stalls, A. M. Kuijsten (*Cultura, 29 (1917), No. 347, pp. 216–228, pl. 1*).—Lighting and ventilating methods are described and mathematical formulas given.

RURAL ECONOMICS.

Rural planning and development, T. Adams (*Ottawa: Com. Conserv. Canad., 1917, pp. [9]+281, pls. 65*).—This report is a study of rural conditions and problems in Canada, and discusses present systems of surveying and planning land in rural areas, rural transportation and distribution (railways and highways), rural problems that arise in connection with land development, organization of rural life and rural industries, government policies and land development, returned soldiers and land settlement, and provincial planning and development legislation.

The report concludes that several matters require special attention, and recommends that "the federal and provincial government legislation and machinery for dealing with the control of the planning, settlement, and development of land be extended and improved.

"There should be closer cooperation than hitherto between federal, provincial, and municipal governments, and between different branches of the public service, in regard to all matters dealing with land.

"The surveying branches of the governments should be strengthened and more comprehensive surveying work assigned to them.

"A complete and coordinated system of federal, provincial, and municipal administration of land resources should be devised, with the whole organization centralized in a department or permanent commission of the federal government.

"Definite steps should be taken by joint government action to prevent the holding of agricultural land by absentee landlords for purely speculative purposes. The operations of vendors of real estate should be regulated, so as to prevent misrepresentation and other immoral practices in connection with the sale of land, and all real estate operators should be licensed by governments under safeguards designed to prevent improper dealing in land.

"Provincial governments should reconsider their systems of administrating, colonization, highways, municipal affairs, and public health, with special regard to the need of securing more cooperation and efficiency in connection with land and municipal development than is possible under present conditions and for increasing the responsibilities and powers of municipal authorities, under the advice of a skilled department of local government in each Province.

"To meet a temporary need, the federal government should take an active interest in the housing of workers engaged in munition plants, particularly in government arsenals and in small towns and rural districts where there is lack of strong local government. The federal government should either require adequate accommodation and proper sanitary conditions to be provided at a reasonable cost for those who are engaged in the service of the country, or itself assist in making that provision, as is being done in Great Britain and allied countries."

United States Food Administration policies and plan of operation [with reference to] wheat, flour, and bread (*Washington, D. C.: U. S. Food Admin., 1917, pp. 171, fig. 1*).—This publication outlines the world situation with reference to wheat, and contains a general statement with reference to the marketing of the 1916 crop, and as to the supply for 1917. It describes the plan of the Food Administration for the organization of government buying, with suggestions for the saving of wheat. It also contains orders and proclamations under the Food Control Act, and instructions and explanations issued by the Food Administration with reference to conduct of flour mills and the milling trade.

Agriculture clubs in California, B. H. CROCHERON (*California Sta. Circ. 190 (1918), pp. 24, figs. 14*).—The author states that the assumption on which agriculture clubs start are as follows:

"(1) The agricultural institutions of the State and nation have information which, applied to farming, will increase farm profits. (2) Many boys and some girls want to make money by farming and would like to be shown how. (3) The chances for individual success are increased when several persons in a neighborhood undertake the same work, an added interest for which comes through competition."

He discusses briefly the history of the agriculture clubs in California, and suggests a model constitution and rules with reference to conducting various club activities.

Value of a small plat of ground to the laboring man, W. C. FUNK (*U. S. Dept. Agr. Bul. 602 (1918), pp. 10, pls. 3, fig. 1*).—This is a study of food raised by operators in southern cotton-mill towns, and is based on records of 548 gardens, 165 poultry flocks, 75 cows, and 62 pigs.

It was found that the average size of the gardens was 723 sq. yards, the average value of the vegetables raised $29.87, and the average cash expenditure

$3.54. The average size of the flocks was 13.2 hens, and the number of eggs used and sold was 86 dozen, valued at $19.35. In addition, the number of fowls sold and used was 36, valued at $11.07, making a total income of $30.42 per flock. The average cash expenditure was $16.22. In the case of the pigs, the average purchase price was $6.34, and the average live weight at killing was 270 lbs., valued at $24.30. The cost of feed was $12.12, leaving a net return of $5.84 after deducting the purchase price. The value of the produce from the dairy cow was estimated at $119.90, and the average cost of feed was $80.49 a year.

A study of haymaking crews and labor costs, H. B. McClure (*U. S. Dept. Agr. Bul. 578 (1918), pp. 50, figs. 13*).—This bulletin is based on a study of the methods of gathering hay from the different parts of the Northeastern and Central States. Altogether it describes 53 different methods found, including cost data.

The author points out that small crews often were more efficient than very large ones. Five push rakes often will put into the stack as much hay as seven, since the latter, where the haul is short, will bring the hay in much faster than it can be stacked. Bailing hay from the field was found to be the cheaper system of putting hay into the bale, but this system usually can be used to advantage only in regions where little or no rain falls during the haying season. The two reasons given why the hay loader is not in more general use were the relatively large cash outlay entailed and the fact that handling hay on the wagon with a loader is very heavy work as compared with driving a push rake.

A system of accounting for fruit shipping organizations, G. A. Nahstoll and J. R. Humphrey (*U. S. Dept. Agr. Bul. 590 (1918), pp. 60*).—"The system outlined in this bulletin is intended to cover all operations incident to the handling of growers' supplies and of the growers' fruit, from the time it is received at the packing-house until final returns have been made for it. The aim has been to avoid duplication and to reduce clerical work; care has been used to provide a method applicable to the working conditions of the local offices, which are not always favorable, and to allow for a proper division of labor."

This book also gives a brief discussion and sample copies of the various types of forms and records necessary to complete the system.

A plan for short term farm loans in Connecticut, G. C. Smith (*Conn. Agr. Col. Ext. Serv. Bul. 10 (1917), pp. 8, figs. 2*).—This pamphlet explains a plan for a short-term loan to farmers as adopted by banks and trust companies in Connecticut, and includes forms of statements used, together with suggestions as to methods of obtaining credit.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt., 4 (1918), No. 2, pp. 9–20*).—This number contains the usual data with reference to estimated farm value of important products, range of prices of agricultural products at important centers, and range of prices received by producers in the United States, and data as to the estimated number and value of the principal classes of live stock. It also contains special articles on the weight of mature farm horses and mules, price of live stock by ages or classes, yearly marketings of live stock, monthly price of milch cows, beef cattle, calves, sheep, wool, hogs, the United States foreign trade in meat animals and meat products, number of live stock in the principal countries and changes since the outbreak of the war, number of horses used per plow, and depth of plowing, together with other miscellaneous data.

Agriculture in Oklahoma, L. C. Snider (*Okla. Geol. Survey Bul. 27 (1917), pp. 131–142, 247–325, figs. 8*).—These pages contain statements with reference to the soils, principal crops, and live stock, together with data for each county showing the physiography, geology, industries, and population.

AGRICULTURAL EDUCATION.

History of the Michigan Agricultural College and biographical sketches of trustees and professors, W. J. BEAL (*East Lansing, Mich.: Mich. Agr. Col., 1915, pp. VIII+519, pls. 2, figs. 266*).—Chapters are devoted to accounts of the laying of the foundation of the college, the administrations of its successive presidents, courses of study, extension work, methods of teaching, manual labor, influence of the grange and farmers' clubs upon the college, college publications, the campus and buildings, attendance, endowments and appropriations, etc. An appendix contains the opinions of alumni, including some who have taught only in a separate college of agriculture or in an agricultural college connected with the university and others who have had the dual experience of teaching in both types of institutions, as to whether an agricultural college should be independent or united with a university.

Reports of the development commissioners on their proceedings during the years ended March 31, 1913, 1914, 1915, 1916, and 1917 (*Rpt. Develop. Comrs.* [*Gt. Brit.*], *3 (1913), pp.* [*2*]*+72; 4 (1914), pp.* [*2*]*+77; 5 (1915), pp.* [*2*]*+14; 6 (1916), pp.* [*2*]*+12; 7 (1917), pp.* [*2*]*+13*).—A detailed review of action taken and progress made under the Development Act is given for each year. The report for 1913 also contains a brief explanation of the legal position of the commissioners under the act, and some of the practical results from it.

In the report for 1917 the commissioners state that since the commencement of the war advances from the development fund have been mainly confined to schemes already established, for which just sufficient advances have been recommended to secure continuity. They have also recommended expenditures on certain new schemes in order to meet war conditions, particularly in connection with food supply and natural products, the two most important advances recommended during the year being $607,500 for the purchase of an estate for sugar-beet growing and $243,000 for improving the fish food supply. Expenditures were also recommended for a largely increased supply of plants for afforestation purposes and increased growings of flax for aeroplane cloth, as well as for the preparation of preliminary surveys and reports of projects of development for commencement after the war when the employment of labor upon a large scale may be desirable. The total of recommended expenditures during the year for agriculture, rural industries, and forestry was $1,360,916, including loans amounting to $607,500. The sum total of advances recommended for this purpose up to March 31, 1917, was $9,116,952, including loans amounting to $1,370,087.

Report of the agricultural and housekeeping schools for 1915–16 (*Aarsber. Offentl. Foranst. Landbr. Fremme, 1916, II, pp. VIII+359*).—This is a detailed report on the faculty, students, equipment, instruction, farm work, and receipts and expenditures of the agricultural and housekeeping schools in Norway.

Education (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vols. 4, pp. XV+650, figs. 6; 5, pp. XVII+658, figs. 11*).—These volumes contain the report of Section IV, Education, of the Second Pan American Scientific Congress, held in Washington, D. C., December 27, 1915, to January 8, 1916. Among the papers and discussions in volume 4 are the following relating to agricultural education, which have been previously noted (E. S. R., 34, p. 307): Education for the Baccalaureate Degree as Administered in Agricultural Colleges, by A. C. True (pp. 80–87); A National System of Agricultural Education, by H. J. Waters (pp. 226–229); A Decade in Agricultural Education, by A. M. Soule (pp. 229–241); and Agricultural Instruction, by J. Comallonga y Mena (pp. 305–344).

Volume 5 contains, among others, papers on agricultural education as follows: Scientific Agriculture or Agricultural Education in Brazil, by L. F. S.

Carpenter (pp. 341–345), a review of the status and further needs of agricultural education in Brazil; Agriculture in Secondary Schools with Special Reference to the State of Minnesota, A. V. Storm (pp. 345–353), which deals with the development of State-aided secondary agricultural education in Minnesota; Agricultural Education in County Schools, by H. L. Russell (pp. 353–357), in which are discussed the efforts that have been made in Wisconsin to establish agricultural education in secondary schools through a system of county agricultural schools and county short courses in agriculture; The American College of Agriculture, by F. B. Mumford (pp. 357–359), which discusses briefly the proper function and purpose of the agricultural college, the author holding that the real function of the undergraduate course in agriculture is and should be to train men thoroughly for agriculture as a vocation, and that the training of teachers, investigators, and technical experts must be accomplished by graduate departments; Agricultural Education, by E. Davenport (pp. 360–363), which treats of the two great objects in agricultural education, viz, to train for farming and to fit for country life; Agricultural Extension Work, by G. I. Christie (pp. 363–369), in which are considered the needs of agriculture and country life, and a few of the mediums and methods employed in extension work to meet these needs; and What Preparation Should be Required of Students for Admission to National and State Colleges of Agriculture, by B. H. A. Groth (pp. 569–574).

How school gardens tend to direct a natural course in botany, GENEVIEVE MONSCH (*School Sci. and Math., 18 (1918), Nos. 1, pp. 36–42; 2, pp. 124–129*).—The author outlines and discusses, by weeks, a 10 weeks' course in botany developed with a class of seventh grade girls and boys. Only 50 hours of class time were given to the course, but individual members of the class were permitted to work in the garden at odd times. In conclusion, attention is called to the difference in the sequence in a course in botany founded directly and entirely on garden work, as the one described, and the ordinary textbook work.

School gardens and greater production, L. A. DEWOLFE, R. P. STEEVES, J. B. DANDENO, R. FLETCHER, A. W. COCKS, F. W. BATES, and J. H. KITELEY (*Agr. Gaz. Canada, 4 (1917), No. 12, pp. 1073–1079, figs. 7*).—The aims and methods of school-garden and food-production work in Nova Scotia, New Brunswick, Ontario, Manitoba, and Saskatchewan are outlined and some of the results obtained are noted.

Rural school fairs, W. J. REID, L. A. DEWOLFE, R. P. STEEVES, J. H. MCOUAT, J. C. MAGNAN, R. S. DUNCAN, F. W. BATES, A. W. COCKS, J. MCCAIG, and J. C. READEY (*Agr. Gaz. Canada, 5 (1918), No. 1, pp. 52–73, figs. 10*).—These reports by agricultural education officials deal with the organization and development of rural school fairs in Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, Saskatchewan, Alberta, and British Columbia.

Accomplishments of boys' and girls' clubs in food production and conservation, O. H. BENSON (*Ann. Amer. Acad. Polit. and Soc. Sci., 74 (1917), No. 163, pp. 147–157*).—The author describes the work and some of the results of the boys' and girls' clubs in food production and conservation in 1916. It is stated that it cost the Federal Government, States, and local people 79 cts. per capita to supervise, direct, instruct, and encourage boys and girls in food production work. As a result, it is estimated that they produced an average of $20.96 worth of food for the Nation, thus returning $20.17 net profit on the investment.

Ten lessons on our food supply, W. G. VINAL (*Gen. Sci. Quart., 2 (1918), No. 2, pp. 337–344*).—This is a summary of lessons taught in the Rhode Island Normal School, and intended to be merely suggestive as to the method of teaching. The lessons deal, respectively, with the organization of the course, com-

munity projects in food conservation, local community projects, the fundamentals of an adequate diet, the cost of breakfast, a comparison of the cost of breakfast for the different members of the class, some of the reports on individual projects, new foods and methods, a war breakfast, and organizing the school into a working unit.

MISCELLANEOUS.

Report of Porto Rico Station, 1916 (*Porto Rico Sta. Rpt. 1916, pp. 31, pls. 5*).—This contains the organization list, a summary by the agronomist in charge as to the general conditions and lines of work conducted at the station during the year, and reports of the chemist and assistant chemist, horticulturist, assistant horticulturist, entomologist, and plant pathologist, the experimental features of which are abstracted elsewhere in this issue.

Report of the experiment station committee of the Hawaiian Sugar Planters' Association, 1917 (*Hawaii. Sugar Planters' Assoc., Rpt. Expt. Sta. Com., 1917, pp. 25*).—This includes a report by the director on the work of the station for the fiscal year ended September 30, 1917.

Report of the executive committee of the Commonwealth Advisory Council of Science and Industry, 1916–17 (*Advisory Council Sci. and Indus., Aust., Rpt. 1916–17, pp. 56*).—This report covers the period from April 14, 1916, to June 30, 1917. It discusses the policy and nature of the work of the committee, including the collection of information for the use of executive and State committees and a proposed permanent institute, the distribution of research grants of about $17,000, and some of the principal results thus far obtained.

Monthly Bulletin of the Ohio Experiment Station (*Mo. Bul. Ohio Sta., 3 (1918), No. 1, pp. 31, figs. 14*).—This contains several articles abstracted elsewhere in this issue; Permanent Pastures, by C. W. Montgomery; Ox Warble Flies, an abstract of the article previously noted (E. S. R., 37, p. 464); and notes.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta., Mo. Bul., 5 (1918), No. 11, pp. 157–172*).—This number contains brief articles on the following subjects: Contagious Abortion of Cattle, by J. W. Kalkus; The Organization of Cooperative Agricultural Associations, by A. Hobson; Tomato Culture in Western Washington, by J. L. Stahl; Spring-sown Grain Crops for Western Washington, by E. B. Stookey; Artificial Incubation, by Mr. and Mrs. G. R. Shoup; Orchard Spraying, by A. Frank; and a garden planting calendar.

Guide to plats (*Massachusetts Sta. Guide to Plats, 1916, pp. 20, pls. 2, fig. 1*).—Plans for the field plats of the agricultural department of the station are given, together with a description of the plats and their treatment and brief notes on the principal results obtained.

NOTES.

California University and Station.—The formal dedication of the first of the new buildings for the Citrus Substation and Graduate School of Agriculture was held March 27.

R. S. Vaile, assistant professor of orchard management at the Citrus Substation, has accepted an appointment from the National Armenian Relief Commission to go to Persia as agriculturist. His work is expected to be of an extension nature and designed to rehabilitate the agricultural interests of the region.

Idaho University and Station.—A substation for the study of problems incident to high altitudes was authorized at the last session of the legislature. Action has been taken by the board of regents looking toward its establishment on State land at Felt, in Teton County, at an elevation of approximately 6,300 feet.

In response to direct requests from farmers, the department of bacteriology has sent out this year cultures sufficient for the inoculation of 15,000 acres of legumes. The cultures are sold to farmers of Idaho and neighboring States at the actual cost of manufacture, exclusive of equipment, of approximately 20 cents per acre.

J. S. Jones has resigned as director and chemist of the station and professor of agricultural chemistry in the university, effective June 30, and has assumed charge of the operating laboratory of one of the Government nitrate plants under the Ordnance Division of the War Department. Other resignations include W. C. Edmundson as assistant professor of horticulture and assistant horticulturist to accept a position with the Bureau of Plant Industry of the U. S. Department of Agriculture, Glenn S. Ray as assistant professor of farm crops to become agricultural advisor for Franklin County, Wash., and A. C. Burrill as station entomologist to accept a position with this Department as extension entomologist with headquarters in eastern Washington. Dr. T. L. Hills, bacteriologist of the university and station, has been granted leave of absence for the period of the war and has been commissioned first lieutenant in the Sanitary Corps.

L. E. Longley, formerly of this Department, has accepted an appointment as assistant professor or horticulture and assistant horticulturist. R. H. Smith has been appointed entomologist and has been detailed to southern Idaho for special work in the study of the clover aphis.

Purdue University and Station.—O. E. Reed, of the Kansas College and Station, has been appointed chief of the department of dairy husbandry beginning August 1. R. E. Caldwell, acting chief of the department, has resigned to engage in commercial work. Chester G. Starr, acting associate in animal husbandry, has been appointed agricultural agent for Tazewell County, Ill. P. W. Mason, assistant professor of entomology, has accepted a position in the Division of Deciduous Fruit Insects in the Bureau of Entomology of the U. S. Department of Agriculture.

Massachusetts College.—A new department of horticultural manufactures has been established with W. W. Chenoweth of the pomological department as

its head. The work to be developed will deal principally with questions of preserving fruits and vegetables, utilizing by-products which have formerly been wasted, and the like.

Benjamin G. Southwich, of the Connecticut College, has been appointed demonstrator of farm management, vice Wesley H. Bronson now in war service. Daniel J. Lewis has been appointed assistant to the director of extension service. Harry R. Francis, of the forestry department of Syracuse University, has been appointed garden supervisor, and Wm. F. Howe, assistant in the direction of boys' and girls' club work. A. S. Thomson, assistant professor of market gardening, has been elected superintendent of schools for a group of towns in Franklin County.

Michigan College and Station.—Vocational teacher training in agriculture and home economics was begun in March under the provisions of the Smith-Hughes Law. E. L. Grober has been appointed in charge of agricultural teacher training work, and Miss Elizabeth Frazer in home economics.

The botanical laboratory has been named the Beal Botanical Laboratory in honor of Dr. W. J. Beal, professor emeritus.

L. H. Cooledge, assistant professor and research associate in bacteriology, and I. F. Huddleson, research assistant in bacteriology, have enlisted in the Army Medical Corps. Miss L. Zae Northrop and Dr. E. T. Hallman have been appointed research associates in bacteriology. Chas. Robinson, chemist of the station, C. F. Murphy, graduate assistant in plant physiology, B. E. French and T. E. Friedemann, instructors in chemistry, and J. Frank Morgan, research assistant in bacteriology, have been granted leave of absence for military service. Ray Nelson has been appointed research associate in plant pathology, vice J. H. Muncie. Everett Doherty, instructor in agricultural chemistry at the Oregon College, has been appointed assistant professor of chemistry beginning next September. Dr. W. L. Chandler, instructor in parasitology at Cornell University, has been appointed research associate in entomology in the station, vice Dr. G. D. Shafer.

A short course in tractor management recently held reached an attendance of 135.

Missouri University and Station.—Benjamin W. Tillman, of the Soil Survey of the U. S. Department of Agriculture, has been appointed extension assistant professor of soils beginning June 1. F. W. Faurot, extension assistant professor of horticulture, has resigned. A. H. Hollinger, instructor in entomology and deputy inspector of nurseries, was succeeded April 4 by K. C. Sullivan. J. L. Stadler and Cannon C. Hearne have been appointed assistants in farm crops.

Nebraska University and Station.—J. W. Rovner has been appointed assistant professor of dairy husbandry. Elliott Davis has been appointed assistant professor of animal husbandry, vice H. B. Pier, resigned. E. L. Jenkins, assistant professor of animal husbandry, is on leave of absence for Army service, and B. H. Thompson has resigned as instructor of dairy hubandry for the same purpose. H. M. Plum has resigned as professor of agricultural chemistry to take up chemical work in connection with war industries.

New Jersey College and Stations.—Two courses in farm tractor operation, continuing for two weeks each, were given at the college during March.

Experiments in the use of fertilizers on potatoes have been begun in cooperation with the State potato association. The department of entomology is making detailed maps of the area infested by the Japanese beetle, with a view to attempting its extermination.

The State seed laboratory has been unusually active in making analyses for persons interested in particular lots of seeds. Large numbers of sam-

ples of vegetable seeds have been received for test in comparison with those for previous years. Over 300 lots of seed corn, representing several thousand ear samples, have been tested with results demonstrating the urgent need for testing corn this season.

Work has been begun on a calf barn, for which the legislature appropriated $9,000.

Dr. Louis M. Massey has been granted leave of absence as assistant professor of plant pathology at Cornell University and assigned to this station by the U. S. Department of Agriculture to conduct extension work in plant pathology. Mitchel Carroll has been appointed first assistant to the entomologist for mosquito control and experimental work.

John H. Hankinson has resigned as State leader of farm demonstration. Irving L. Owen has been appointed manager of the college farm to succeed C. S. Van Nuis. Willard C. Thompson, assistant poultry husbandman, has resigned to enlist in military service.

New Mexico Station.—J. R. Meeks has resigned as dairyman to take up county agent work in Indiana. Charles E. Cormany has been appointed assistant agronomist. J. M. Franklin, assistant in horticulture, has resigned to join the Navy.

North Dakota College and Station.—Dr. A. F. Schalk, professor of veterinary physiology in the college, has been appointed station veterinarian. James Godkin has been appointed assistant botanist. C. J. T. Doryland, soil bacteriologist, has been granted leave of absence for six months.

Oregon College and Station.—At the last annual session of the board of regents, the president of the board was appointed to take charge of the special war-time work which will be carried on in connection with the regular college activities. President Kerr has been lecturing very extensively on food conservation and the war in Oregon, North Dakota, Idaho, and other States.

Two service flags, made by the home economics club and bearing 1,235 stars, have been presented to the college by the students' assembly. At the annual commencement, June 3, 192 students received degrees and 23 received certificates. The freshman and sophomore classes have been larger than ever before and the decrease in the upper classes has been merely nominal and due to heavy enlistments.

H. V. Tartar has resigned as associate professor of agricultural chemistry and station chemist to accept a position on the chemical staff of the University of Washington. R. V. Gunn, assistant instructor in agricultural economics and farm practice at the University of Wisconsin and assistant in agricultural economics at the Wisconsin Station, has been appointed assistant professor in farm management extension beginning July 1. Clair Wilkes has been appointed assistant in farm management. L. W. Wing, jr., instructor in dairy husbandry, and Fred W. Miller, instructor in veterinary medicine, are now serving in the aviation section of the Signal Corps.

Science notes that Dr. F. E. Denny, of the University of Chicago, has been appointed research assistant in horticulture, vice J. R. Magness, effective April 1. Dr. Helen M. Gilkey, of the University of California, has been appointed assistant professor of botany and curator of the herbarium, to succeed the late H. S. Hammond.

R. W. Allen, superintendent of the Umatilla Substation at Hermiston, has resigned to accept a position with the U. S. Department of Agriculture. L. R. Breithaupt, superintendent of the Harney County Substation, has been succeeded by John Martin of the Belle Fourche, S. Dak., Substation of the Bureau of Plant Industry of this Department.

Pennsylvania College and Station.—The resignations are noted of L. C. Tomkins, April 1, as instructor in dairy husbandry extension, and R. S. Spray as assistant in botany, April 10. H. D. Edmiston, for many years assistant in agricultural meteorology and transferred in 1915 from assistant in agricultural chemistry to assistant in agricultural extension, died March 17.

W. S. Taylor, formerly associate professor of agricultural education in the University of Texas and more recently engaged in graduate work at Cornell University, has been appointed professor of agricultural education beginning April 1. Other appointments include W. B. Connell as instructor in animal husbandry extension, M. D. Leonard and S. W. Frost as instructors in entomology, and R. C. Walton as instructor in plant pathology.

South Carolina College and Stations.—The resignations are noted of F. J. Crider, professor of horticulture and associate horticulturist, to become professor of horticulture at the University of Arizona; W. L. Hutchinson as professor of agronomy and acting chief of the agronomy division, and succeeded by C. P. Blackwell as professor of agronomy, chief of the agronomy division, and agronomist of the station; R. L. Shields as professor of animal husbandry and chief of the animal husbandry division of the station; W. A. Thomas as assistant professor of entomology and assistant entomologist; Dr. W. A. Barnett as associate professor of veterinary science and assistant State veterinarian; G. M. Armstrong as instructor in botany and assistant botanist, to engage in pathological extension work for the Bureau of Plant Industry of this Department; and L. H. Leonian as research assistant in horticulture to engage in plant disease survey work for the Bureau of Plant Industry. G. H. Collings has been appointed assistant professor of agronomy and assistant agronomist. H. E. Shiver has returned as assistant chemist of the station.

Texas College and Station.—J. H. Foster, in charge of the division of forestry and State forester, resigned April 1, and has been succeeded by E. O. Seicke. L. B. Burk, associate professor of animal husbandry, who has been acting as collaborating animal husbandman in swine investigations for the station, has resigned to accept a position with the Bureau of Markets of the U. S. Department of Agriculture. The station swine work has been put in charge of P. V. Ewing, animal husbandman of the station.

E. R. Spence, superintendent of the feeding and breeding substation near the college, resigned April 30 to engage in farming in Missouri, and has been succeeded by N. E. Winters, transferred from the Angleton Substation. E. A. Miller has been appointed superintendent of the Angleton Substation. R. W. Edwards, superintendent of the Chillicothe Substation, resigned March 1 to take charge of a farm in Kansas, and has been succeeded by A. B. Cron of the Office of Forage Crop Investigations of this Department.

It is reported that up to the present time an amount equivalent to over 25 per cent of the annual station salary budget has been subscribed to Liberty Loan Bonds of the various issues by members of the staff.

Washington College and Station.—Dr. F. L. Pickett, head of the department of botany, has been appointed botanist in the station. W. S. Robertson has been appointed assistant horticulturist.

Wyoming Station.—Dr. H. M. Martin, research assistant in veterinary science, has resigned to accept a position with the University of Nebraska and has been succeeded by Dr. S. H. Burnett of Cornell University.

Association of American Agricultural Colleges and Experiment Stations.—It is announced that the thirty-second annual convention of this association will be held at the Southern Hotel, Baltimore, Md., November 13–15, 1918.

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U. S. DEPARTMENT OF AGRICULTURE

STATES RELATIONS SERVICE

A. C. TRUE, DIRECTOR

Vol. 38 — ABSTRACT NUMBER — No. 9

EXPERIMENT STATION RECORD

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1918

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EXPERIMENT STATION RECORD.

Vol. 38. Abstract Number. No. 9.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Contribution to the chemistry of gossypol, the toxic principle of cotton seed, F. E. Carruth (*Jour. Amer. Chem. Soc., 40 (1918), No. 4, pp. 647–663*).—Continuing the investigations previously noted (E. S. R., 38, p. 685), a special study was made of the chemical nature of gossypol.

Analyses of the purified substance prepared by several different methods which are given in detail show an empirical formula for gossypol of $C_{30}H_{28}O_9$ or $C_{30}H_{30}O_9$. It forms a crystalline compound with acetone, amorphous acetyl and benzoyl derivatives, and an insoluble substance with aniline. It readily forms salts with alkalis, and dissolves easily in sodium hydroxid and carbonate and very slowly in bicarbonate and disodium phosphate. Limewater and baryta water and ammonium hydroxid, both strong and dilute, do not dissolve it as readily as do alkali hydroxids. Alkaline solutions of gossypol oxidize readily on exposure to air or by adding hydrogen peroxid with the formation of a complex substance. Strong nitric acid dissolves gossypol with the formation of a substance no longer giving color reactions.

Three new substances which resemble gossypol more or less have been isolated. One called "B" gossypol is formed by heating gossypol in the air to its decomposition point. "C" gossypol is formed by fusing gossypol with alkalis to a fairly high temperature. "D" gossypol can be isolated from cottonseed meal and is thought to be the substance formed from gossypol in the cooking of cotton seed. The "B" and "C" forms are less poisonous than the original gossypol, but the "D" variety, although less toxic than the original gossypol, has been shown to give rise to cottonseed meal poisoning of rabbits and swine. If rather dry seed is used in the preparation of cottonseed meal, the gossypol is apparently not so readily converted into the less soluble, less toxic oxidation product but remains in part as such in the meal, causing such a meal to be more toxic than a properly cooked meal.

"Attempts to get a clue to the constitution of gossypol have failed through inability to split the substance into simpler known substances.

"The fact that several flavone pigments occur in the cotton plant and the fact that gossypol has 30 carbon atoms suggests that it may be derived by condensation and subsequent reduction of two molecules of a flavone. The acidic properties are thought to be due to carbonyl and hydroyxl groups arranged as in flavonols rather than to carboxyl groups. These substances are sufficiently acid to form salts from an alkali acetate. The presence of *o*-hydroxyl is indicated by the green ferric chlorid reaction and by the formation of lake-like compounds with lead and ferrous salts. The presence of 9 oxygen atoms

may be readily accounted for by the presence of 5 hydroxyls, 2 carbonyl groups, and 2 bridge oxygen atoms. all of which types occur in the flavonols."

Corn stover silage, J. M. Sherman and S. I. Bechdel (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 9, pp. 589–600*).—The authors at the Pennsylvania Experiment Station have tested the practicability of ensiling corn stover, and investigated the nature of the fermentation in the silage obtained. The stover used had been kept for several months and was quite dry at the time of cutting. It was cut and packed in the silo by means of tramping, water being added in a continuous stream. Samples of the silage were taken at frequent intervals and examined for general appearance, texture, and aroma. At the end of the experiment feeding tests were made. It was concluded that corn stover ensiled with a suitable quantity of water (from 2 to 2.5 parts by weight of water to 1 of stover) undergoes fermentation with the production of a palatable silage resembling ordinary corn silage in aroma and appearance and possessing good keeping quality.

In investigating the nature of the fermentation, determinations were made of the volatile and nonvolatile acids, temperatures, and numbers, and types of bacteria at various stages. The total acidity was somewhat lower than in ordinary silage, but the ratio between the volatile and nonvolatile acids agreed closely. A gradual decrease in volatile and an increase in nonvolatile acids were noted. The temperature changes were similar to those observed in ordinary silage. Bacteriological observations showed that the rather complex bacterial flora present at the beginning of the process gives way to one which is almost entirely acid-forming as the fermentation progresses.

In connection with a study of the nature of the fermentation, the authors review the present status of the question as to whether bacteria or plant cells are mainly responsible for silage fermentation (E. S. R., 35, p. 9; 36, pp. 611, 802; 37, pp. 208, 612). While their results tend to support the cell respiration theory, conclusions on this point are withheld. The fermentation taking place in stover silage is, however, believed to be similar in its essential points to that of ordinary silage and caused by similar factors.

The biochemical phenomena of oxido-reduction, [J.-E.] Abelous and [J.] Aloy (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 7, pp. 270–272; abs. in Chem. Abs., 11 (1917), No. 21, pp. 2909, 2910*).—In repeating the experiments of Bach on milk, previously noted (E. S. R., 26, p. 507), the authors have found that a large number of substances other than aldehydes act as coferments, among them the amins, heterocyclic compounds, terpenes, and mineral salts. On addition of an oxidizable substance simultaneous oxidation and reduction occurs. It would seem that there is present in milk an agent able to decompose water to furnish oxygen to the oxidizable and hydrogen to the reducible substances.

The necessity of a hydrogen acceptor and an oxygen acceptor for the manifestation of the processes of oxido-reduction in organic liquids of animal and vegetable origin, J.-E. Abelous and J. Aloy (*Compt. Rend. Acad. Sci. [Paris], 166 (1918), No. 3, pp. 130–132*).—Continuing the work noted above, experiments on the oxidation of salicylic aldehyde in milk and potato juice, with and without the addition of oxidizing substances like methylene blue or potassium chlorate, have shown the presence in milk of an agent capable of decomposing water in the presence of a hydrogen acceptor and an oxygen acceptor, both of which are indispensable. Although the nature of this agent is unknown it appears to act like a soluble ferment.

Studies on enzym action.—XV, Factors influencing the proteolytic activity of papain, E. M. Frankel (*Jour. Biol. Chem., 31 (1917), No. 1, pp. 201–215, figs. 2*).—The papain used in this work was purified by dissolving in water,

precipitating with acetone, redissolving in water, and reprecipitating with alcohol. The optimum action of papain was found to be at $pH = 10^{-5}$. Papain seems to act like urease, invertase, and lipase in forming an intermediary compound which is broken up into cleavage products and liberates the enzym. The quantitative relations of the enzym, hydrocyanic acid, and protein lend support to the view that there is a ternary compound formed which then breaks down. Hdyrocyanic acid may be recovered almost quantitatively from digestion mixtures, indicating that it is not utilized in the reaction of fermentation but that it can renew proteolysis in papain digests that are almost in equilibrium.

Studies on enzym action.—XVI, The formation of ester-hydrolyzing substances by the action of alkali on proteins, Florence Hulton-Frankel (*Jour. Biol. Chem., 32 (1917), No. 3, pp. 395–407; abs. in Chem. Abs., 12 (1918), No. 3, p. 281*).—The present investigation was undertaken to determine whether the activity of the ester-hydrolyzing substances follows the general laws of enzym action and to what extent they are specific in their action. The proteins used were casein, gelatin, and dried egg albumin. The esters used were of a high grade of purity and were in most cases redistilled after drying over sodium carbonate. The factors studied were the influence of concentration of alkali used and duration of action, of hydrogen ion concentration on the activity of alkali-treated proteins, of temperature of standing on the action of alkali on protein, the lipolytic activity of a papain digestion mixture of casein, and the effect of boiling on the lipolytically active substance.

It was found that proteins when treated with alkali yield substances which have the power to accelerate hydrolysis of esters. For casein, gelatin, and egg albumin, 3 N alkali seemed to produce solutions of the highest activity. These solutions showed greater activity at a concentration of the hydrogen ions less than 10^{-7} N. or they were more active in a slightly alkaline solution. The time and temperature at which the alkali stood in contact with the protein did not affect the activity of the solution except where the temperature was above 80° C. The solution obtained by hydrolyzing the protein by acid instead of alkali did not possess ester-hydrolyzing properties.

Polarimetry (*U. S. Dept. Com., Bur. Standards Circ. 44 (1918), 2. ed., rev. and enl., pp. 196, pls. 2, figs. 13*).—This is a revised and enlarged edition of the circular issued in 1914. It contains chapters on absolute measurement in circular degrees, saccharimeters, temperature corrections and control, polariscope tubes, cover glasses, flasks, thermometers, weights, optical activity in organic compounds, testing of raw sugar, polarimetric analysis of other sugars, estimation of reducing substances, the preparation of pure sugars, general instructions to applicants for tests, etc. In the appendixes 43 pages of additional data have been added comprising 10 tables, the results of recent polarimetric researches, a consideration of the polarization of low-grade products, a resumé of the work of the International Commission for Uniform Methods of Sugar Analysis, and amendments to the U. S. Treasury Department sugar regulations.

An improved automatic pipette-washing device, A. V. Fuller (*Jour. Indus. and Engin. Chem., 10 (1918), No. 4, p. 297, fig. 1*).—This is a modification of the device previously noted (E. S. R., 38, p. 203), the improvements being greater capacity, smaller table space occupied, lower first cost, and cleaning of both outside and inside pipettes.

A new method of extracting the soil solution, C. B. Lipman (*Univ. Cal. Pubs. Agr. Sci., 3 (1918), No. 7, pp. 131–134; abs. in Chem. Abs., 12 (1918), No. 10, p. 1094*).—By means of a special form of pressure tube the author has succeeded in obtaining from soils the soil solution as it exists in thin films

around the soil particles. The method, which will be described in detail in a later paper, allows of the direct determination of the concentration of the soil solution and of the amounts of each of the solutes contained therein, and offers a means of obtaining quickly and directly large portions of the soil solution as it exists naturally under field conditions when crops are growing.

The valuation of lime for various purposes, R. K. MEADE (*Jour. Indus. and Engin. Chem., 10 (1918), No. 3, pp. 214–219, fig. 1*).—This is a collection of material on the more important uses of lime in the arts, the classification of limes according to chemical composition, etc., the properties which lime should possess to be acceptable in each industry, and the methods most generally employed for the chemical analysis of lime.

Notes on the analysis of molasses, H. S. WALKER (*Jour. Indus. and Engin. Chem., 10 (1918), No. 3, pp. 198–202*).—Experimental evidence indicates that in Clerget sucrose determinations in waste molasses the method of clarification with lead subacetate solution as recommended by the Hawaiian Chemists' Association yields results from 0.5 to 0.7 per cent too high, due to the large volume occupied by the lead precipitate. Clarification with dry lead subacetate is apt to run a little low, especially if an excess of lead is used. A modification of the dry lead method which gives more correct results is described.

A comparison of the proximate and mineral analysis of desiccated skim milk with normal cows' milk, E. P. HARDING and H. RINGSTROM (*Jour. Indus. and Engin. Chem., 10 (1918), No. 4, pp. 295–297*).—Proximate and mineral analyses are reported of four different samples of commercial desiccated skim milk and the results compared with previous analyses of skim milk powders and with normal cows' milk. The color, odor, and emulsifying power of the samples were noted.

The data show that the percentages of the mineral constituents in the four samples agreed quite closely, but did not agree well with those found by other analyses. The sulphuric acid, calcium and magnesium oxids, and phosphoric anhydrid were higher and the ferric oxid lower than in other methods. The high phosphorus and calcium content may be due to phosphate and calcium added as emulsifiers.

The proximate analyses agreed quite closely with previous analyses. The color, odor, emulsifying power, high protein, low lactose, high calcium and phosphorus content, and low total proximate analysis of one of the samples indicated that it was not genuine desiccated skim milk powder.

Tentative standard methods for the sampling and analysis of commercial fats and oils (*Jour. Indus. and Engin. Chem., 10 (1918), No. 4, pp. 315–320, fig. 1*).—To the methods previously noted (E. S. R., 38, p. 206) have been added methods for the determination of the iodin value according to the Wijs method and the saponification or Koettstorfer number.

The determination of arsenic in insecticides by potassium iodate, G. S. JAMIESON (*Jour. Indus. and Engin. Chem., 10 (1918), No. 4, pp. 290–292*).—The author has applied the iodate titration method as first described by Andrews (E. S. R., 15, p. 226) to the determination of total arsenic in arsenical insecticides or fungicides, and compared the results with those obtained by the official iodimetric method (E. S. R., 35, p. 207). The method is described in detail and data reported of the determination of arsenic in several samples of Paris green and zinc arsenite.

The results of the test analyses agree closely with those obtained by the official method. "This accurate method is not only quicker, but is simpler than the iodin titration. The very definite and remarkably sharp end-point, the great stability of the potassium iodate solution, and the readiness with

which it can be prepared all recommend its use in place of the iodimetric procedure."

An optical method for the determination of malic and tartaric acids in the same solutions, J. J. WILLAMAN (*Jour. Amer. Chem. Soc., 40 (1918), No. 4, pp. 693–704, fig. 1*).—The method described is based upon the use of a given set of conditions in constructing tables or curves with known amounts of pure malic and tartaric acids, which curves can then be used for the determination of unknown quantities of these acids. The combination of conditions to give satisfactory results from the standpoints of accuracy, ease of manipulation, and applicability to materials from varied sources was determined after a study of the effect of various factors on the rotating power of solutions of malic and tartaric acids. The method adopted is as follows:

An amount of the sample that will probably furnish at least 0.1 gm. of either acid and not more than 0.6 gm. of tartaric acid and 0.8 gm. of malic acid is neutralized with approximately normal ammonium hydroxid, treated with 2 volumes of 95 per cent alcohol, and the pectins filtered off on a Büchner funnel and washed with alcohol. To the filtrate is added an excess of a 10 per cent barium acetate solution in 50 per cent alcohol and enough 95 per cent alcohol to make 14 volumes to 1 of the original solution. The precipitated barium salts are removed by centrifuging or by filtering on a Büchner filter. The precipitate is transferred to a beaker with hot water, heated to boiling, 10 cc. of 20 per cent ammonium sulphate solution added, and the mixture concentrated on the steam bath to about 80 cc. volume and transferred to a 100 cc. flask. After cooling, 6 cc. of glacial acetic acid is added and the contents made up to the mark with water. It is then filtered or centrifuged and two 25 cc. aliquots of the clear solution are treated, respectively, with 10 cc. of 8 per cent uranium acetate solution, and 10 cc. of 10 per cent ammonium molybdate solution. After standing in the dark for three hours, the solutions are polarized in a 2 dm. tube at about 20° C. The two readings are then referred to the graph and the amounts of malic and tartaric acids computed.

As some of the reagents and conditions may be difficult to duplicate in some laboratories the author recommends that each worker adopt conditions and reagents as near as possible to those listed and then standardize his procedure against known amounts of malic and tartaric acids. The factors likely to be subject to change in different laboratories and which can be safely changed, provided they are incorporated in the above standardization, are the kind of light used with the polariscope, the length of time of standing before polarization, the temperature at which the polarization is made, and the purity of the uranium and molybdenum salts used as activators.

The method is said to be applicable for all products containing *d*-tartaric or *l*-malic acid, or both. Highly colored solutions can be worked with only after decolorizing with bromin and neutralzing the hydrobromic acid formed with ammonia.

The deterioration of raw cane sugar: A problem in food conservation, C. A. BROWNE (*Jour. Indus. and Engin. Chem., 10 (1918), No. 3, pp. 178–190, figs. 15*).—The results of chemical and mycological investigations on the deterioration of raw cane sugar are reported.

Periodic analyses of sugars showed that the so-called factor of safety, $\frac{W}{100-S}$, where W is the percentage of water and S the percentage of sugar, should be about 0.3. If sugars are to be kept where the temperature maximum exceeds 20° C., only such sugars should be selected as have a factor of safety below 0.3. Where sugars of low factor deteriorate, the explanation may be

that the sugar is losing moisture and that the loss in polarization from destruction of sucrose is counterbalanced by the drying out of the product, or that there is uneven distribution of moisture with consequent fermentation where the films of molasses adhering to the sucrose are more dilute. The following corollaries to the ratio between moisture and nonsucrose as the governing factor in the keeping quality of raw cane sugar should be considered: (1) Slight fluctuations in moisture content have a much greater influence upon the keeping quality of high-grade than of low-grade sugars, (2) displacement or saturation of moisture by nonsucrose constituents should render a questionable sugar fit for storage, and (3) sugars which are prevented from absorbing moisture, as in a sealed container, can deteriorate only to a certain limit.

Mycological investigations with raw Cuban sugar showed the presence of a relatively harmless noninverting Torula, named by the author *T. communis;* two destructive varieties of Monilia, *M. nigra* and *M. fusca;* a liquefying inverting organism to which the name *Bacterium invertens* was given; and other organisms, including molds. The conclusions emphasized by the author are "that the microorganisms of raw cane sugars, as regards their action upon sucrose, are in part harmless and in part destructive; that the destruction of sucrose in deteriorated sugar is not due to any single organism or class of organisms; molds and budding fungi, as well as bacteria, must be looked for when searching for the agents of destruction; and that the fungi and bacteria, which cause the inversion of sucrose in raw sugars, are unable to thrive in saturated solutions. The washing of raw sugars in the centrifugals, by diluting the saturated films of sirup to a point where the inverting organisms can thrive, must therefore be regarded as a leading cause of deterioration."

As a means of prevention of the deterioration of raw cane sugars the author suggests that "in the matter of manufacture it is necessary to exercise the utmost possible cleanliness and care in order to diminish infection, to control the moisture content of the sugar so that the ratio of nonsucrose to water is within the limits of safety, and to cool the sugar thoroughly before bagging to prevent the migration of water and the formation of zones of high moisture content. In the matter of storage it is necessary to keep the sugar perfectly dry in warehouses which are rain-proof, to keep the warehouse tightly closed in wet weather to prevent the sugar absorbing moisture from the air, and to construct the warehouse and store the sugar so as to secure in dry weather the maximum ventilation underneath and between the bags."

General instructions regarding the manufacture of fruit wines, J. DE BANÓ (*Instrucciones Generales sobre la Fabricacion del Vino de Frutas. Mexico City: Dir. Gen. Agr., 1917, pp. 34, figs. 9*).—This publication includes general methods for the manufacture of fruit wines and cider, and special directions and recipes for sparkling cider, pear cider, and cherry, currant, mulberry, pomegranate, orange, honey, and quince wines.

Beechnut oil, an indigenous edible oil to manufacture in time of war, A. TRUELLE (*Vie Agr. et Rurale, 7 (1917), No. 38, pp. 209, 210*).—This article gives a summary of the different phases of the manufacture of beechnut oil and of the properties and uses of the oil and its by-products with a view toward its greater utilization as an edible oil and in soap making. The analytical constants of the oil are given, together with the analysis of the decorticated and undecorticated oil cake. The undecorticated cake is poisonous, but the decorticated can be used to advantage in animal feeding. The purified oil has an agreeable taste resembling that of hazelnuts and can be used as a table oil alone or mixed with olive oil.

Influence of time of harvest, drying, and freezing of spearmint upon the yield and odorous constituents of the oil, F. Rabak (*Jour. Indus. and Engin. Chem., 10 (1918), No. 4, pp. 275–279*).—Investigations of spearmint oil having indicated that esters or alcoholic compounds play an important part as carriers of the aroma and flavor, a study of the plant was undertaken at Arlington Farm, Va., to obtain information regarding the effect of time of harvest, drying of the plant, and frost action upon the constituents as well as upon the yield and physical properties of the oils. The plants were harvested and distilled at three different stages of growth, viz, budding, flowering, and fruiting.

It was found that the yield of oil is affected by seasonal conditions, being distinctly higher in some seasons than in others. The maximum content of oil is present during the flowering period, the tops containing the largest amount of oil. Esterification and alcohol formation tend to increase, and yield of total oil to decrease, during the maturing and drying of the plants. Freezing of the plant produces a marked increase in the formation of the odor-bearing esters and alcohols.

A preliminary study of the Philippine coconut oil industry, P. A. Villyar (*Philippine Agr. and Forester, 6 (1917), No. 2–3, pp. 66–83, figs. 10*).—A study of the factory conditions in some oil-producing localities in the Province of Laguna is reported. The article includes a description of the native hand-press and machine-press methods with illustrative plates, and an efficiency study of 11 native factories based on field investigation of methods practiced and appliances used, on laboratory analyses of samples obtained in the field investigation, and on a comparison of the native methods of coconut oil extraction with the modern methods.

As a result of the study the author offers the following suggestions for the improvement of the coconut oil industry:

"Cooperation is urged as a remedy against the loss of money due to poor cultural methods, to the improper preparation and handling of coconut products, and to the combined work of the middlemen. Adoption of modern methods is essential to increase the copra and oil production. Nuts for copra and oil manufacture must be properly aged to insure a maximum yield. The passing of laws facilitating the transportation of coconut products should be demanded from the proper authorities."

The manufacture of nut margarin, G. H. Pickard (*Amer. Food Jour., 13 (1918), No. 1, pp. 16–19*).—This article includes a description of the raw materials used and the general processes of manufacture of nut margarin, with a discussion of its digestibility and food value.

The utilization of waste tomato seeds and skins, F. Rabak (*U. S. Dept. Agr. Bul. 632 (1917), pp. 15*).—This includes a review of work already done in foreign countries on the utilization of tomato waste, an investigation of the annual output of tomato refuse in the United States, a comparison of methods of separating the ingredients of the waste, and chemical analyses and value of the most important ingredients.

It is estimated that the annual dry waste from the tomato industries in the United States is about 1,500 tons of seeds and 1,800 tons of skins. From the seeds can be extracted an oil averaging by the continuous extraction process 22 per cent of the dry seeds.

The refined oil is similar in constants to cottonseed, soy-bean, sesame, and corn oils. Digestibility experiments by the Office of Home Economics show a coefficient of digestibility of 97, comparing favorably with the common edible oils. It possesses a certain value as a paint or varnish oil and makes a soap of good texture. The residue after extraction of the oil compares favorably

with other seed meals used for stock feed, analysis showing moisture 7.15, ash 4.64, protein 37, nitrogen-free extract 29.1, and fiber 22.11 per cent. By incorporating the dried skins with the meal, the annual amount available as feed stuff would be about 3,000 tons.

The accumulation of tomato residue occurs principally in the North Central and North Atlantic States. The author of the bulletin suggests that the reduction of waste material to oil and meal could best be handled by establishing a reducing plant at some central point in each of these sections. In view of the threatened shortage of fatty oils, it is suggested as an economic measure of both agricultural and industrial importance that the utilization of this material be considered.

The utilization of waste tomato seeds and skins, F. Rabak (*Chem. News, 117* (*1918*), *No. 3040, pp. 100–104*).—A condensation of the above article.

The effect of incomplete distillation on the yield of products in the destructive distillation of birch, R. C. Palmer (*Jour. Indus. and Engin. Chem., 10* (*1918*), *No. 4, pp. 260–262*).—Semicommercial laboratory distillations were made with birch in which the distillation was stopped before completion and the brands obtained redistilled.

The results showed that the combined effect of the distillation in two steps gave practically the same yields of valuable products as when the distillation was completed in one step. The order in which the products were formed in the destructive distillation process is formic acid, acetic acid, tar soluble in pyroligneous acid, wood alcohol, and oily tar.

The influence of moisture on the yield of products in the destructive distillation of hardwood, R. C. Palmer and H. Cloukey (*Jour. Indus. and Engin. Chem., 10* (*1918*), *No. 4, pp. 262–264*).—Uncontrolled and controlled destructive distillations were made with beech, birch, and maple, one lot of which had been seasoned for about 18 months and the other for about 8 months. In uncontrolled distillation the maximum fire was kept under the retort until the tar point was well established, and the fire was then checked so that the distillation was completed largely by means of the exothermic reaction. In the controlled distillation the fire was checked at the first indications of tar in the distillate and the firing so regulated that after that point the rate of rise in temperature was appreciably lower than in uncontrolled distillations. The effects of moisture and control on the yields of the various products were as follows:

The highest yields of acetic acid from beech and maple were obtained with carefully controlled distillations after moderate seasoning; with birch the amount of seasoning did not seem to affect the total yield. The highest yields of formic acid were obtained from rapid uncontrolled distillation, particularly in the case of beech. Excess of moisture gave higher yields of alcohol in the case of beech, and in uncontrolled distillation, of maple. The drier wood gave more alcohol in the case of birch, and in controlled distillation, of maple. Excess of moisture gave a lower yield of tar in maple and birch and of charcoal in maple and beech.

The effect of catalyzers on the yield of products in the destructive distillation of hardwoods, R. C. Palmer (*Jour. Indus. and Engin. Chem., 10* (*1918*), *No. 4, pp. 264–268*).—Preliminary laboratory experiments were made for the purpose of studying the influence of hydrolytic catalyzers on the formation of wood alcohol, acetic acid, etc., (1) during the primary reaction occurring in the destructive distillation of wood and (2) during any secondary reactions that take place between the original products. Experiments were also made on the distillation of wood in the presence of wood tar in a study of the possibility of splitting off methyl groups from the tar to form methyl alcohol. Maple and

wood chips were used which had been soaked in phosphoric acid as a catalyzer. Analyses were made of the moisture content of the charge; weight of distillate and charcoal; and percentage of total, acetic, and formic acids, settled and soluble tar, wood alcohol, and acetone in the distillate. The conclusions drawn from the preliminary tests are as follows:

"(1) Under the proper conditions a very high yield of acetic acid may be obtained by the destructive distillation of wood, by using phosphoric acid as a catalyzer. Two and seven-tenths times as much acid as normal was obtained in one run. (2) The distillation of wood in the presence of phosphoric acid showed a pronounced tendency to give more wood alcohol. Increases varying from 40 to 90 per cent were obtained. (3) The distillation of mixtures of wood and tar under pressure showed that the methoxy groups in the tar can be readily split off, forming wood alcohol. Nearly 20 per cent of a possible theoretical was obtained at 90 lbs. pressure."

A study is being made of the possiblity of recovering the metaphosphoric acid residual in the charcoal, thus making practicable the use of phosphoric acid as a catalyzer.

Effect of varying certain cooking conditions in the production of sulphite pulp from spruce, S. E. Lunak (*U. S. Dept. Agr. Bul. 620 (1918), pp. 23, pls. 12, figs. 10*).—In the experiments recorded in this publication the following factors involved in the sulphite process for wood pulp were studied for the effect of variations in them on duration of cooking, yield of pulp and of screenings, bleach consumed, and color and strength of pulp produced: (1) Ratio of free to combined sulphur dioxid, or the amount of lime in the cooking liquor; (2) total sulphur dioxid; and (3) temperature of cooking.

The wood used in the experiment was Wisconsin white spruce (*Picea canadensis*), cut into ⅝-in. chips and screened in the usual way. In order to control the various factors the digester was heated by indirect steam. The best method to judge when the digestion was finished proved to be a color test in which the standard was a previously prepared extract of coffee of the desired shade. The methods of analysis are described in detail and a diagram given of the apparatus used.

The experimental data show that at constant temperature and total SO_2 an increase in the combined SO_2 causes an increase in the yield of screened pulp owing to the more thorough cooking, while a decrease in the combined SO_2 causes quicker cooking action. The limit to which the combined SO_2 can be decreased to obtain good cooking seems to be about 1 per cent, below which there is a rapid darkening of the pulp produced, and an increase in the screenings and bleach consumed..

An increase in the total SO_2 causes a decrease in the cooking period and greater ease in bleaching the pulp. The screenings and color of the pulp remain constant, as the total SO_2 is decreased to about 5 per cent, after which there is a rapid increase in both factors.

A decrease in temperature causes more even cooking, with consequent reduction in the amount of screenings and bleach and increase in the yield of pulp.

Some experiments on the pulping of extracted yellow pine chips by the sulphate process, O. Kress and C. K. Textor (*Jour. Indus. and Engin. Chem., 10 (1918), No. 4, pp. 268–270; abs. in Chem. Abs., 12 (1918), No. 10, pp. 1122, 1123*).—Experiments were conducted to determine whether longleaf pine chips, after the extraction of rosin and turpentine, would be suitable for the manufacture of kraft paper.

The results show that a commercial grade of kraft pulp might be made from the chips, but it is evident "that the best results will be obtained if the chips

are carefully selected by means of a proper screening system, by using the largest chip for extraction compatible with maximum recovery of the oils and rosin, and by avoiding, as far as possible, the burning of the chips in the preliminary steaming for removal of turpentine and rosin."

Sulphite turpentine, A. W. SCHORGER (*Jour. Indus. and Engin. Chem., 10 (1918), No. 4, pp. 258–260*).—Attention is called to the sulphite turpentine obtained during the recovery of the sulphur dioxid in the manufacture of pulp by the sulphite process and to its possible value as a source of toluene and of cymene from which carvacrol can be prepared. The recovery of this oil is from 0.36 to 1 gal. of turpentine per ton of pulp. Methods for identifying cymene and for preparing carvacrol from cymene are described.

Van Nostrand's chemical annual, edited by J. C. OLSEN (*New York: D. Van Nostrand Co., 1918, 4. ed., rev. and enl., pp. XVIII+778, pl. 1*).—In the preparation of the fourth issue of this annual a very thorough revision of all tables has been made and about 48 new tables have been added. The section on stoichiometry has been revised and explanations of the use of various tables have been inserted throughout the volume.

Charles Anthony Goessmann (*Cambridge, Mass.: Corporation and Associate Alumni Mass. Agr. Col., 1917, pp. [VII]+187, pls. 11; rev. in Jour. Amer. Chem. Soc., 40 (1918), No. 3, pp. 578–582*).—Dr. Goessmann was associated with the Massachusetts Agricultural College for nearly 40 years as professor of chemistry and first director and chemist of the station (E. S. R., 18, p. 1101; 23, p. 401). The book is not only a personal biography but a historical record of the chemical and agricultural investigations conducted at the college and station during the period of his service there from 1868 to 1907. The book contains also letters from Frederick Wöhler and an appendix consisting of a list of the published writings of Dr. Goessmann and a chronology of his life.

METEOROLOGY.

Suggestions in regard to extending the area of spring wheat culture (*U. S. Dept. Agr., Nat. Weather and Crop Bul., No. 1 (1918), p. 3*).—Briefly reviewing a paper dealing with the northern and southern limits and optimum conditions for spring-wheat culture in the United States "it is shown by means of computing table and maps that there is a considerable area where the climatic conditions appear to be favorable for spring wheat, but in which it has not been tried at all or only in a small way. If it is possible to grow it, even as a catch crop, when winter wheat has been winterkilled and when small quantities are needed for local consumption it would contribute to increased supplies. Such areas include certain sections of Pennsylvania, West Virginia, western Virginia, and western Maryland when tillable land occurs above certain altitudes, as above 600 ft. in northern to above 1,800 ft. in southern Pennsylvania, above 1,800 ft. in northern to above 3,000 ft. in central West Virginia, above 1,800 ft. in western Maryland, and above 2,000 to 3,000 ft. in the mountains north of the 38th parallel of latitude in Virginia. . . . The time to sow, in an average season, will be between about the last of March to May 5, the earlier dates at the lower and the later at the higher latitudes and levels in the States mentioned.

"In addition to these higher altitudes where the conditions should be most favorable for the growth of spring wheat as a catch crop or to increase the area over that devoted to winter wheat, there is a far more extensive area similar in climate to that of northern Illinois and eastern Iowa, Nebraska, and Kansas where the reports show that spring wheat is sometimes grown as a regular or catch crop. Such areas are found in northern and central Indiana and Ohio,

western Pennsylvania, West Virginia, and Virginia between about 800 and 2,000 ft. elevation, and in North Carolina, northwestern corner of Georgia, eastern Tennessee, and Kentucky above about 1,400 ft. elevations. It would seem that experiments with early varieties, such as Marquis, which have been found best adapted to the more southern range in which they have been tried should be undertaken on a small scale in all of these areas. The dates for sowing in the larger area as well as those for the higher levels mentioned will agree closely with those which have been found best for spring oats, and the time it will be ready for harvest will also agree quite closely with that of oats. In the larger area mentioned the time of seeding would be from as early as it is possible to sow in March to the 10th of April, with harvest from the middle of July to the 10th of August."

Nitrites from nitrates by sunlight, B. Moore (*Abs. in Nature* [*London*], *100* (*1917*), *No. 2513, p. 338; U. S. Mo. Weather Rev., 45* (*1917*), *No. 12, pp. 602, 603*).—" Dilute solutions of nitrates exposed either to sunlight or to a source of light rich in light-energy of short wave-length (such as light from a mercury vapor arc inclosed in silica) undergo conversion of nitrate into nitrite. There is an uptake of chemical energy in this reaction transformed from light energy, as in the formation of organic carbon compounds in foliage leaves; it is to be added to the relatively small number of endothermic reactions induced by light. When green leaves are immersed in nitrate solution comparatively little nitrite accumulates, indicating that nitrites are rapidly absorbed by the green leaf. Nitrates taken up by plants from soil would, in presence of sunlight, be changed to nitrites; which are much more reactive than nitrates. This indicates that the early stages of synthesis of nitrogenous compounds are carried out in the green leaf and aided by sunlight. Rain water collected for a considerable time contains no nitrites, all having been oxidized to nitrates; but if exposed to bright sunlight or ultra-violet light for a few hours a strong reaction for nitrites is always obtained. There is no hydrogen peroxid or ozone in air at surface level."

Monthly Weather Review (*U. S. Mo. Weather Rev., 45* (*1917*), *Nos. 11, pp. 529–572, pls. 9, figs. 12; 12, pp. 573–636, pls. 13, figs. 5*).—In addition to weather forecasts, river and flood observations, and seismological reports for November and December, 1917; lists of additions to the Weather Bureau Library and of recent papers on meteorology and seismology; notes on the weather of the months; solar and sky radiation measurements at Washington, D. C., during November and December, 1917; condensed climatological summaries; and the usual climatological tables and charts, these numbers contain the following articles:

No. 11.—Observations of the Neutral Points of Atmospheric Polarization from Great Heights, by A. Wigand (reprinted abs.); Some Nuclei of Cloudy Condensation, III, by J. Aitken (reprinted abs.); Relation between Sunlight and Moonlight, by J. S. Dow (reprinted abs.); Minute Structure of the Solar Atmosphere, by G. E. Hale and F. Ellerman (reprinted abs.); Why the Axes of the Planets are Inclined (illus.) by W. H. Pickering (reprinted); Shall We Revise Our Nomenclature for Thermometric Scales? by C. F. Marvin; Some Researches in the Far Eastern Seasonal Correlations.—Fourth Note (illus.), by T. Okada (abs.); Sun Spots, Magnetic Storms, and Rainfall (illus.), by H. Arctowski; Local Wind of the Foehn Type near San Francisco Bay (illus.), by B. M. Varney; Nebraska Hailstorm of August 8, 1917 (illus.), by G. A. Loveland; Vapor Pressure of Ice, by S. Weber (reprinted abs.); The Arithmetic Mean and the "Middle" Value of Certain Meteorological Observations, by L. Becker (reprinted abs.); and New Zealand Standard Time (reprinted).

No. 12.—Lunar Total Eclipse, 1917, July 4, by L. Picard (reprinted abs.); Lunar Total Eclipse of December 27–28, 1917, at Honolulu, by C. A. Reichelt; Permanent Periodicity of Sun Spots, by J. Larmor and N. Yamaga (reprinted abs.); Polarization of Skylight, by A. Gockel (abs.); Solar Coronæ: Five Years' Recent Observations, by J. Maurer (abs.); Need of Geophysical Observing Stations, by P. Gruner (abs.); West Indies Hurricanes as Observed in Jamaica (illus.), by M. Hall; The Settlement of Tropical Australia (illus.), by G. Taylor (reprinted); Practical Hint in Forecasting Minimum Temperatures, by W. G. Reed; Meteorology and War-Flying, by R. DeC. Ward; Waterspouts Visit Tatoosh Island, Wash., by R. C. Mize; Meteorology of Greenland's Inland Ice and Its Foehn, by A. de Quervain (abs.); Variations of Alpine Glaciers, by P. L. Mercanton (reprinted abs.); Aqueous Exchange between the Névé and the Atmosphere, by R. Billwiller (abs.); Use of Monthly Mean Values in Climatological Analysis, by E. G. Bilham (reprinted abs.); Bathyrheometer as Anemometer, by Y. Delage (abs.); Nitrites from Nitrates by Sunlight, by B. Moore (reprinted abs.) (see p. 811); Centennial of Meteorological Station at the Grand Saint-Bernard, by R. Gautier (abs.); Time Zones at Sea (reprinted abs.); Baron Dairoku Kikuchi, 1855–1917, by T. C. Mendenhall; Rollin Arthur Harris, Ph. D., 1863–1918; and Recent Distinctions in Meteorology.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and A. L. CHANDLER (*Massachusetts Sta. Met. Buls. 349–350 (1918), pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during January and February, 1918, are presented. The data are briefly discussed in general notes on the weather of each month.

SOILS—FERTILIZERS.

Soil survey of Hempstead County, Ark., A. E. TAYLOR and W. B. COBB (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 53, fig. 1, map 1*).—This survey deals with the soils of an area of 465,280 acres in southwestern Arkansas lying entirely within the Coastal Plain province. The topography is generally undulating to gently rolling, the area being well drained, although there are rather extensive level, poorly drained sections consisting of broad flood plains and river terraces.

About 75 per cent of the soil material of the county is residual in origin, the remainder being of alluvial origin. Thirty-three soil types of twenty series are mapped. Ruston fine sandy loam and Ruston very fine sandy loam predominate, occupying 15.8 and 12.1 per cent of the total area, respectively.

Soil survey of Fillmore County, Nebr., A. H. MEYER, C. E. COLLETT, and N. A. BENGTSON (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 24, pl. 1, fig. 1, map 1*).—This survey, made in cooperation with the State of Nebraska, deals with the soils of an area of 368,640 acres in the southeastern part of the State lying entirely within the loess-covered portion of the Great Plains province. The topography of the county ranges from almost flat to slightly undulating, with a small area of terrace and bottom land along the streams. The region as a whole is well drained.

The soils of the county are derived from loess material, glacial drift, and alluvial and lacustrine deposits. Seven soil types of six series are mapped, Grundy silt loam occupying 87.4 per cent of the total area.

Water extractions of soils as criteria of their crop-producing power, J. S. BURD (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 6, pp. 297–309, fig. 1*).—On the basis of investigations at the California Experiment Station on extractable substances (nitrate, phosphate, and basic ions—K, Ca, and Mg) in

cropped and uncropped soil, here reported, the author concludes that the evidence obtained from a strictly chemical examination of the water extracts of soils is sufficient "to justify the hope that we may be able to predict, within reasonable limits, the relative crop-producing powers of soils by comparing their figures expressing these characters with similar data derived from soils whose productive power is known. Before such a method is generally applicable, however, it will be necessary to study the behavior of many soils with numerous type crops."

Effect of season and crop growth in modifying the soil extract, G. R. Stewart (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 6, pp. 311–368, pl. 1, figs. 24*).—In the investigations at the California Experiment Station here reported in detail "the water-soluble nutrients in 13 soils of 2 different types were periodically determined during two seasons. Throughout the second season comparisons were made between the planted soil and its uncropped duplicate. Notable differences were observed between the nitrates, calcium, potassium, and magnesium present in the water extracts from the cropped and uncropped soils. The phosphates did not exhibit corresponding differences. Great dissimilarities were observed in the phosphate content of different soils, but in any one soil the amount was practically constant in both the cropped and uncropped plat. Striking differences occurred between the soluble nutrients present in the various uncropped soils. While the crops were growing the concentrations of nutrients in 8 of the 13 planted soils were practically the same. These eight included both good and poor soils. The three poorest soils yielded the smallest amounts of water-soluble nutrients and the smallest differences between the cropped and uncropped duplicates. The comparisons between the planted and unplanted duplicates furnished valuable indexes of the inherent capacities of the soils to produce nutrients. . . .

"The amounts of the water-soluble nutrients obtained by varying the ratio of soil to water were studied. The relationship of the compounds extracted did not change essentially in the lower concentrations. By comparison with freezing-point determinations the concentration of the soil solution calculated from the water extract was shown to be from two to four or five times as great as the actual soil solution.

"Variations in the water extract were correlated with variations in the freezing points of the same samples of soil. From the results of the freezing-point determinations it is concluded that variations in the water extract reflect actual changes in the soil solution. The results of the investigation show that large amounts of water-soluble nutrients are developed by cultivation, fallowing, and biennial cropping, and demonstrate the soundness of these practices."

A list of 63 references to literature cited is given.

The freezing-point method as an index of variations in the soil solution due to season and crop growth, D. R. Hoagland (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 6, pp. 369–395, figs. 9*).—In the investigations at the California Experiment Station here reported freezing-point depressions were determined on 13 soils under a variety of conditions. The concentration of the soil solution was "found to vary with the season and also as a result of treatment with carbon dioxid, leaching, incubation, etc. The growth of a crop markedly diminished the concentration of the soil solution. This effect was still evident at the beginning of the following season. The soil solutions under conditions favorable to crop growth were found to be very dilute, particularly at the height of the growing season. Certain general agreements between the extraction and freezing-point methods are discussed."

Nine references to literature bearing on the subject are cited.

Humus in mulched basins, relation of humus content to orange production, and effect of mulches on orange production, C. A. JENSEN (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 8, pp. 505–518*).—This is a report of a study made at Riverside, Cal., on (1) the changes in the humus content of soils in basins mulched with different organic substances, (2) the effect of lime on the humus content of the soils, and (3) the relation of the humus content of the soil to fruit production. "Humus" was determined colorimetrically in the extract obtained by boiling the soil, which had previously been freed from lime by extraction with 1 per cent hydrochloric acid, in 7.5 per cent sodium-hydrate solution for 2 minutes. The "basins" referred to were areas in the citrus grove inclosed in earth embankments for purposes of irrigation. The materials used as mulches included alfalfa, sweet clover, bur clover, bean straw, barley hay, pine shavings, and cow manure. The mulches were used with and without the addition of lime, and in one experiment dried blood, tankage, phosphate, bone meal, and sulphur were used in addition to alfalfa and manure mulches.

The percentage of humus in the soil of the mulched basins varied from time to time. With manure and alfalfa mulches it increased more rapidly in clay-loam soils than in lighter soils. As a rule, the increase was greater with manure than with alfalfa. The addition of lime to the manure did not increase the humus, but in most cases there was an increase of humus when lime was used with the alfalfa mulch. Blood, tankage, acid phosphate, bone meal, or sulphur did not appreciably affect the humus content. There was no evidence of appreciable accumulation of humus in the lower depths of the soil as a result of leaching; there was no evident correlation between the humus content of the soil in the mulched basins and the amount of fruit produced; and there was no evident effect of lime on orange production. "Alfalfa and bean-straw mulch in basins on the heavier soil types produced from 30 to 100 per cent more oranges per tree than manure mulch. Manure mulch produced more oranges per tree than either barley hay, sweet clover, bur clover, or pine shavings. These differences were obtained in the summer following the application of the mulches in the preceding fall." Apparently alfalfa and manure mulches had no effect on fruit production of lemons during the first year on lighter soils.

In all experiments so far conducted the mulched-basin system has produced favorable growth response in a few months on the heavier soil types, a longer time being required to produce appreciable response on the lighter soil types.

"It would appear directly from the work here reported, and indirectly from work elsewhere reported, that the degradation products from freshly decomposing organic substances are more effective in orange production than the amount of 'humus' formed. And the value of a given mulch does not necessarily depend upon its being a legume or nonlegume."

The relation of weed growth to nitric nitrogen accumulation in the soil, L. E. CALL and M. C. SEWELL (*Jour. Amer. Soc. Agron., 10 (1918), No. 1, pp. 35–44; abs. in Chem. Abs., 12 (1918), No. 5, p. 511*).—This paper reviews the results of experimental work conducted at the Kansas Experiment Station, in an effort to show that "in the past too much emphasis has been placed on tillage as an agent directly contributing to the formation of nitrates through its effect on [the incorporation of organic matter, the distribution of bacterial flora, aeration, and moisture], and too little emphasis on it as an indirect means of assisting in the accumulation of nitrates by preventing weeds from using them in their growth."

Briefly reviewing previous investigations by the senior author (E. S. R., 33, p. 217), additional experimental work is described in which the nitrates in the soil were determined on plats left uncultivated and weeds allowed to grow, cultivated 3 in. deep, cultivated 6 in. deep, and left uncultivated but the weeds

removed. The average annual development of nitrates for the period of 1914 to 1916, inclusive, amounted to 81.6, 413.3, 481, and 556.3 lbs. per acre, respectively. In 1916 and 1917 the quantity of nitrogen contained in the weeds on the weed plats was determined, calculated as nitrates, and when added to the nitrates present in the soil of the weed plats amounted to 474.3 lbs. of nitrate per acre in 1916 and 358.8 lbs. in 1917, as compared with nitrate contents of 531.5 lbs. in soil cultivated 3 in. deep and 445.7 lbs. in soils with a bare surface in 1916, and 372 and 361.2 lbs., respectively, in 1917. Further observations of nitrate formation in the soils of plats left to weeds and those plowed early (July) and cultivated led to the conclusion that the small amounts of nitrate found in the soil of the weed plats were due to the fact that the nitrates had been reduced by weed growth. Available data seemed to indicate that the depth of cultivation did not greatly affect nitric nitrogen accumulation in the soil of plats prepared in different ways for wheat.

Data similar to that compiled by Cates and Cox (E. S. R., 28, p. 233), relative to the effect of tillage on corn, have been obtained in experiments conducted at this station from 1914 to 1916, inclusive, and show that the uncultivated plats where the weeds were removed produced practically as high yields as the cultivated plats.

In summarizing, the authors state that "if moisture is lost from the soil principally through weed growth, and if nitrogen and other elements of plant food become available rapidly in unstirred soil, it is a matter of economy to handle the soil so that weeds may be controlled with the minimum of labor. It should not be understood that tillage is unessential. It will be necessary . . . to maintain the proper structural conditions of the soil, to dispose of crop residue on the surface of the soil, to incorporate manures and organic matter in the soil, and to place the soil in suitable condition for seed. Further than this, with the possible exception of heavy types of soil, it is doubtful if tillage is essential where the soil is in a receptive condition to absorb rainfall and where there is no weed growth."

A list of 19 titles is appended, comprising the literature cited.

Alkali soils: Some biochemical factors in their reclamation, J. H. Barnes and Barkat Ali (*Agr. Jour. India, 12 (1917), No. 3, pp. 368–389, pls. 5; abs. in Chem. Abs., 11 (1917), No. 22, p. 3082*).—This is a full account of investigations, previously noted (E. S. R., 35, p. 516) from a briefer report, which indicate that the activity of the oxidizing, nitrifying, and nitrogen-fixing bacteria of the soil may be utilized as a simple and effective means of measuring the progress of the reclamation of alkali soils. The methods of making the tests are fully described, and laboratory and field tests in which they were successfully used to measure the progress of reclamation by washing and drainage are reported. The proposed procedure is based upon the conclusion that the salts present in alkali soils do not exert any toxic effect on the plant, harmful effects being observed only when the osmotic pressure of the saline solution exceeds that of the cell sap. The author maintains that this condition can be determined as well and more quickly and easily with soil bacteria than with the higher plants.

It was found that nitrifying organisms are comparatively resistant to the ordinary alkali salts and can withstand a solution of higher osmotic pressure than the higher plants. That is, increased nitrification begins in a soil before it is sufficiently freed of soluble salts to admit of the growth of ordinary crops. The ammonifying organisms were found to be still more resistant than the nitrifying organisms. Apparently all of the organisms affecting the nitrogen supply of the soil are present in alkali soils, but are dormant as long as the

soluble salts are in excess and immediately become active when the excess of salts is removed.

"The method adopted is not to attempt a count of the organisms present, but to measure their chemical activity under standard conditions. This involves the measurement of the rate of carbon dioxid formation, the rate of nitrification of ammonia both in a nutrient solution and in the soil, and the rate of nitrogen fixation. The figures so obtained give an index to the number and condition of the bacteria responsible for these important processes or will, in other words, be an indirect measure of the decrease in the osmotic pressure of the soil water, using for the test not merely one type of organism but all those responsible for the three chief chemical reactions necessary to the full fertility of the soil."

Some observations on the occurrence of infertility under trees, Jatindra Nath Sen (*Agr. Jour. India, 12 (1917), No. 3, pp. 390–405, pls. 5; abs. in Chem. Abs., 11 (1917), No. 22, p. 3078*).—Data are presented from observations on the occurrence of infertile spots under tamarind trees and bamboo clumps. They indicate that, while numerous factors were perhaps involved, the infertility in these particular cases was due mainly to the accumulation of soluble salts accelerated by the great transpiring power of the plants which removed the soil moisture, leaving behind the greater part of the soluble salts.

Results of fertilizer experiments conducted at the Pee Dee Station, T. E. Keitt (*South Carolina Sta. Bul. 193 (1917), pp. 3–24*).—Rather extensive fertilizer experiments in progress at the Pee Dee substation are described, and the results obtained from the first rotation (1914 to 1916, inclusive) are reported. The experiments embrace four series each containing 45 tenth-acre plats. Three series consist of 3-year rotations of corn and cowpeas, oats followed by cowpeas, and cotton, and the fourth series of cotton grown continuously. Detailed tabulated data are presented and discussed, showing the yields obtained with each crop under the different fertilizer treatments, and comparisons are made of the effects of the different fertilizer ingredients used singly and in combination. The results in general are regarded as tentative. The more or less definite conclusions may be summarized as follows:

The addition of potash to phosphorus on this soil was beneficial in most cases where the rotation was used, but had little if any effect where cotton was grown continuously. Nitrate of soda used as a top-dressing gave good results generally when applied to cotton, both when grown continuously and in rotation, the results indicating that nitrogen is the first limiting factor in cotton production. Very little benefit was gained through the application of either muriate of potash or kainit alone, although marked increases of seed cotton were obtained from a combination of nitrogen and potash on cotton grown continuously. Neither ground limestone nor caustic lime proved to be profitable on this soil in either the common 3-year rotation or where cotton was grown continuously. Applications of lime failed to give increased yields of cotton even when a heavy growth of cowpea vines was incorporated with the soil. The best time for plowing under cowpea vines appeared to be after the peas were picked, rather than at the time of most luxuriant growth.

A simple way to increase crop yields, H. A. Miller (*U. S. Dept. Agr., Farmers' Bul. 924 (1918), pp. 24, figs. 10*).—Cropping conditions on the impoverished light soils of the Coastal Plain area of New Jersey, Maryland, Delaware, and Virginia are described. The principal need of the region is said to be a liberal supply of organic matter obtained chiefly through the growing of leguminous crops such as crimson clover, cowpeas, soy beans, red clover, and hairy vetch; and of rye, buckwheat, or suitable grasses. Commercial fertilizers and lime are recommended when necessary to stimulate the growth of the soil-

improving crops. Improved cropping systems are outlined, and the results obtained from systems followed on some of the more successful farms of the region are described.

Our mineral supplies.—Nitrates, H. S. Gale (*U. S. Geol. Survey Bul. 666–Z* (*1917*), *pp. 4*).—This is a brief review of the nitrate situation in the United States, it being pointed out that there is in the United States no known natural source of nitrates that can be counted on to furnish any considerable supply of the refined nitrate salts. Imports and consumption in the United States for various purposes, including fertilizers and explosives from 1912 to 1916, are summarized and artificial nitrogen fixation processes reviewed. It is stated that while the electric arc fixation processes are fundamentally the simplest, a great amount of electric power is required. "It seems doubtful if the power available in this country could be spared for use in this way. . . .

"By-product ammonia, derived from the production of coke and of illuminating gas, is an important source of combined nitrogen and is an available source for the production of nitric acid or nitrates. Such ammonia can be practically oxidized to nitrates, and the supply of this material is therefore available to relieve emergency requirements should other sources fail."

Sulphate of ammonia: Its source, production, and use (*New York: The Barrett Co., 1917, pp. 23, figs. 19*).—This is a brief practical treatise on the sources, production, and use of ammonium sulphate, with particular reference to its use as a fertilizer.

Vegetation experiments on the availability of treated phosphates, J. G. Lipman and H. C. McLean (*Soil Sci., 4* (*1917*), *No. 4, pp. 337–343, fig. 1*).—Vegetation experiments on the availability of untreated ground rock phosphate, ground phosphate rock previously composted with sulphur, and acid phosphate are reported.

It was found that "some crops can utilize the phosphorus in floats to good advantage. This is particularly true of buckwheat. The ability of buckwheat to use effectively the phosphorus of ground, but otherwise untreated, phosphate rock suggests that this crop may be made a valuable green manure and employed to increase the content in the soil of organic matter and of available phosphorus. Ground rock phosphate properly composted with ground sulphur becomes a source of available phosphorus and may be employed to advantage as a substitute for acid phosphate."

Sixteen per cent acid phosphate, M. A. Bachtell (*Agr. Col. Ext. Bul.* [*Ohio State Univ.*] *13* (*1917–18*), *fig. 4, pp. 15, figs. 7*).—This bulletin, summarizing experimental work at the Ohio Experiment Station, states that from 600 to 1,000 lbs. of acid phosphate per acre can be used with profit during a rotation of three or four years on most Ohio soils, and that 16 per cent acid phosphate should not cost over $16 a ton. Other practical information on the subject is given.

Explorations and studies of the beds of phosphorites in Russia, 1914, I͡A. V. Samoïlov (*Otchet Geol. Izsli͡edov. Fosfor. Zalezhei, 7* (*1915*), *pp. 25+591, pls. 8, figs. 71; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 8* (*1917*), *No. 4, pp. 561, 562*).—This report for the year 1914 of the Commission for the Study of Phosphorite Beds (of the Agricultural Institute of Moscow), contains twelve detailed accounts of the phosphorite beds of many districts of Russia, made by various authors and enlarged with numerous figures, plates, and maps. An introduction by Samoïlov summarizes the general results of the researches and explorations of 1914. The principal facts are summarized as follows:

In 1914 research work and explorations were carried out in the Provinces of Samara, Tambov, Kursk, Orel, and Kaluga, and in the districts of Turgaish and the Ural Mountains. In each district the productivity of the beds, their

total surface area, the total quantity of phosphorites contained in the beds, and the corresponding total quantity of phosphoric anhydrid, were estimated. The phosphorites were divided into three groups, containing, respectively, from 12 to 18, from 18 to 24, and more than 24 per cent of phosphoric anhydrid. Among the phosphorites studied in 1914 those of group 2 were found in 13 out of 17 of the beds examined and usually contained 20 per cent of phosphoric anhydrid. The phosphorites of the other four beds belonged to group 1.

The districts examined in 1914 contained a total surface area of beds of 1,730 square miles, a total quantity of phosphorites of 1,730,000,000 tons, and a total quantity of phosphoric anhydrid of 283,000,000 tons. The average production was 7 cwt. per 10 square miles.

If the quantity of phosphorites estimated in the beds in 1914 be added to that of preceding years, a total of 5,020,000,000 tons is obtained, of which 68.1 per cent is in group 1, 29.2 per cent in group 2, and about 2 per cent in group 3.

The report ends with a study by Samoĭlov of the phosphorite beds of the right bank of the river Desna (Krolevets district, Chernigov Province). These beds on account of their origin, their form, the large accumulation of phosphoric nodules of various types, and the nature of the cementing body, possess particular scientific interest from a geological and mineralogical point of view.

Influence of carbonates of magnesium and calcium on bacteria of certain Wisconsin soils, H. L. Fulmer (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 8, pp. 463–504, figs. 11*).—Investigations at the Wisconsin Experiment Station are reported in which the effect of magnesium and calcium carbonates, limestone, monocalcium phosphate, and dibasic magnesium phosphate (and in certain cases calcium and magnesium chlorids) on the number and activity (ammonia and nitrate formation and nitrogen fixation) of bacteria was studied with pure cultures and with the ordinary flora in acid Colby silt loam soil, acid Plainfield sand, and neutral Miami silt loam. "The calcium carbonate, magnesium carbonate, and limestone were added in amounts sufficient to satisfy one-fourth, one-half, and full calcium-carbonate requirement—that is, to neutralize one-fourth, one-half, and the total active acidity." The phosphates were added in varying amounts.

It was found that the number of bacteria in the acid silt loam and acid sand was increased by the applications of calcium carbonate, magnesium carbonate, or limestone, magnesium carbonate increasing the number to a much greater extent than either calcium carbonate or limestone. Monocalcium phosphate and dibasic magnesium phosphate slightly increased the number of bacteria in neutral soil.

Nitrification was promoted by adding limestone, calcium carbonate, or magnesium carbonate. In soils to which no nitrogenous matter had been added, magnesium carbonate favored nitrate accumulation more than either calcium carbonate or limestone. The phosphates increased the accumulation of nitrate nitrogen to a very small extent. When gelatin was added to the soil, magnesium carbonate did not increase nitrification any more than calcium carbonate or limestone. The three carbonates increased ammonification of blood meal by pure cultures of *Bacillus tumescens* and *B. subtilis* in sterile acid silt loam soil.

A culture of *B. azotobacter* failed to show an increase in total nitrogen in the acid sand treated with carbonates and mannit and only a slight gain in acid silt loam soil so treated. Pure cultures of *B. radicicola*, of both alfalfa and lupine strains, and *B. azotobacter* were greatly benefited when inoculated into the sterile acid silt loam soil previously treated with magnesium carbonate or calcium carbonate. Limestone barely increased the number of *B. azotobacter*

in the acid silt loam soil. In neutral and acid soils made strongly alkaline with magnesium carbonate the increase in number of *B. azotobacter* was much greater than in the untreated soils.

The data in general show that magnesium carbonate was superior to calcium carbonate or limestone in stimulating the reproduction of bacteria in acid silt loam and acid sand soils. As a rule the smaller applications gave better results than the larger.

A list of 64 references to literature cited in the article is given.

Nitrification as a measure of the availability of different forms of calcium carbonate when employed as correctors of soil acidity, P. S. BURGESS (*Soil Sci., 4* (*1917*), *No. 4, pp. 327–336, fig. 1*).—Experiments conducted at the Hawaiian Sugar Planters' Experiment Station with coral sand and finely-ground coral limestone are reported.

It was found that "where no additions of nitrogen are made, coral sand and ground coral limestone are about equally effective in enhancing the nitrification of an acid soil's own organic nitrogen. After neutralizing Hawaii acid soils, the average amounts of nitrate formed over a period of five months under optimum conditions are comparatively small. The increment of gain in nitrate formed over the soil exactly neutralized, due to adding twice the amounts of lime required (either as coral sand or as ground limestone), is too slight to warrant double applications. Twice the required amounts of coral sand effect a greater increase in nitrate produced over the soils exactly neutralized than do twice the amounts of finely-ground coral limestone.

"Where coral sand was used in sufficient amounts to bring the soils to exact neutrality, the following percentages of gain over the soils to which no lime in any form was added, are indicated: No nitrogen added (soil's own nitrogen), 486 per cent; dried blood nitrogen added, 165 per cent; and ammonium sulphate nitrogen added, 398 per cent. Where finely-ground coral limestone was used to neutrality, the following percentages of gain over the 'no lime' cultures are indicated: No nitrogen added (soil's own nitrogen), 518 per cent; dried blood nitrogen added, 235 per cent; and ammonium sulphate nitrogen added, 608 per cent.

"Comparing the average percentage of increased nitrate production due to neutralizing exactly the soil with coral sand with that brought about by the addition of finely-ground coral limestone, where both ammonium sulphate nitrogen and dried blood nitrogen were supplied, we have, as a general average over the entire incubation period of five months, an increase of 281 per cent due to sand applications and an increase of 421 per cent due to ground limestone applications. From these figures a simple ratio shows that, when lime availability is measured in the soil by enhanced nitrification, 1 ton of the finely-ground limestone is practically equivalent, in neutralizing soil acidity, to 1.5 tons of the best grade of coral sand."

The principles of the liming of soils, E. C. SHOREY (*U. S. Dept. Agr., Farmers' Bul. 921* (*1918*), *pp. 30, figs. 6*).—This presents information regarding the materials used in liming and their preparation, together with a discussion of the changes, so far as they are known, which are brought about in the soil by lime. The relative merits of different forms of lime and the factors which determine their use in farm practice are fully explained. A list of terms commonly used in the discussion of liming is included.

The use of lead for stimulating growth in plants, A. STUTZER (*Jour. Landw., 64* (*1916*), *No. 1–2, pp. 1–8; abs. in Jour. Chem. Soc.* [*London*], *110* (*1916*), *No. 648, I. p. 704; Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 8* (*1917*), *No. 6, pp. 844, 845; Chem. Abs., 11* (*1917*), *No. 8, p. 1008*).—"Experiments carried out in 1914 and 1915 on the action of aqueous solutions of lead

nitrate showed that plants grew vigorously when treated with small quantities of lead. The maximum growth was obtained with 0.5 gm. of nitrate per liter of nutritive solution. Not only did larger quantities affect the development of the roots, but they also retarded that of the leaves. The same results were obtained in this respect with all the experimental plants, rye, wheat, oats, barley, maize, and peas. The difficulty of spreading the lead nitrate was overcome by making it into a fine powder and mixing it well with the potash salt or sodium nitrate used as manure. Manuring experiments with beets resulted in a certain increase in yield of both roots and sugar which could be attributed to the lead nitrate. Potatoes, on the other hand, proved very sensitive to the action of lead, which caused a decreased yield of tubers and starch."

In experiments with wheat in sandy loam, "the addition of 44 lbs. of nitric nitrogen to the basic manure increased the grain yield by 880 lbs.; 56 per cent of this nitrogen was assimilated. The addition of 9 lbs. of lead nitrate only increased the grain yield by 187 lbs. as compared with the basic manure and only 21.5 per cent of the nitrogen was assimilated. The addition of 66 lbs. of nitric nitrogen to the basic manure increased the grain yield by 1,320 lbs. and 82.3 per cent of the nitrogen was assimilated. In this case the addition of 9 lbs. of lead nitrate had a favorable effect on the grain yield, which it increased by 2,123 lbs. as compared with the basic manure. . . .

"There is nothing against the practical use of lead nitrate and, so long as the manufacturer can guarantie a uniform distribution of the lead, the mixing of lead nitrate with potash salts and sodium nitrate on a commercial basis is recommended."

Commercial stocks of fertilizer and fertilizer materials (*U. S. Dept. Agr., Office Sec. Circ. 104* (*1918*), *pp. 12, figs. 5*).—This circular presents statistical information obtained through the War Emergency Fertilizer Survey of October 1, 1917, regarding the stocks on hand and in transit; the quantities under contract or option for delivery before April 1, 1918; comparative figures based on returns from concerns reporting for both 1916 and 1917; imports; and production of nitrate of soda, potash, sulphuric acid, sulphate of ammonia, slaughterhouse and garbage tankage, sulphur, foreign and domestic pyrites, acid and rock phosphate, mixed fertilizers, cottonseed meal and cake, dried blood, raw and steamed bone, fish scrap, cyanamid, and base goods.

The returns for 1917 showed an increase over 1916 in commercial stocks of potash, sulphate of ammonia, and acid and rock phosphate, while a marked decrease was noted in the case of nitrate of soda, mixed fertilizers, dried blood, slaughterhouse and garbage tankage, and to a less degree of sulphuric acid and foreign and domestic sulphur and pyrites.

Peat in 1916, J. S. Turp (*U. S. Geol. Survey, Min. Resources U. S., 1916, pt. 2, pp. 289, 290*).—Statistics regarding the use of peat as fertilizer and fertilizer filler, stock food, and litter in the United States during 1916 are given. Of the total consumption of 55,548 short tons, 48,106 tons was used as fertilizer and fertilizer filler, as compared with 38,304 tons in 1915.

AGRICULTURAL BOTANY.

Significance of colloidal chemistry in physiology, W. Crocker (*Trans. Ill. Acad. Sci., 8* (*1915*), *pp. 47–68*).—This paper deals with the colloidal nature of living cells, general characteristics and water relations of cell colloids, diffusion in a colloidal medium, enzyms and immunity bodies as colloids, some colloidal phenomena of soils, and topics in colloidal chemistry and their bearing upon physiology (as in aging seeds), giving a bibliography of the subject.

Osmotic pressure in animals and plants, W. R. G. Atkins (*Sci. Prog. [London], 11 (1917), No. 44, pp. 562–577*).—Summing up observed results in comparative studies of osmotic pressures in animal and plant cells, the author notes that in this respect, as well as in other phases of their physiology, there is an abbreviated recapitulation of phylogeny in case of members of each division, notwithstanding the difference in the conditions under which the two great divisions of living matter have developed.

It is stated that in animal cells the upper limit of osmotic pressure is not far from 7.5 and that within the body each cell may be considered as a water dweller, being in osmotic equilibrium with the other cells and the intercellular solutions. In primitive naked plant cells, in free sperms, and in unfertilized ova, the osmotic relationships are much the same as those for lower animals. In case of higher plants, however, the presence of a comparatively inextensible cellulose wall brings about entirely new conditions (which are discussed), and as a result very great differences as regards osmotic pressure exist in the different tissues. In this division a very great part of this osmotic influence is due to nonelectrolytes, sugars preponderating. The effect of light upon chlorophyll-bearing organs is considered by far the most powerful of the many causes which influence osmotic pressure in plants.

The main purpose of this paper is to emphasize the differences existing as regards osmotic pressure in animals and in plants.

Carbon assimilation, I. Jörgensen and W. Stiles (*New Phytol., 14 (1915), Nos. 8–9, pp. 240–250; 10, pp. 281–294; 15 (1916), Nos. 1–2, pp. 11–23; 3–4, pp. 85–96; 5–6, pp. 117–135, figs. 6; 7, pp. 144–160, figs. 7; 8, pp. 176–193; 9–10, pp. 205–232, figs. 4; 16 (1917), Nos. 1–2, pp. 24–45, fig. 1; 3–4, pp. 77–104*).—This is mainly a review of recent work by different investigators on the pigments of the green leaf and on the processes connected with them.

Buffer processes in the metabolism of succulent plants, Jenny Hempel (*Compt. Rend. Lab. Carlsberg, 13 (1917), No. 1, pp. 130, figs. 16*).—The author gives an account of investigations carried out on plants subjected to widely different external conditions, designed to determine the concentration of hydrogen ions in the cell sap extracted from leaves and the relation of such concentration of hydrogen ions to the quantity of contained acid as shown by titration, and to estimate the importance of such relation.

It is stated that in the sap from leaves of succulent plants the concentration of hydrogen ions varies, but is determined by the quantity of titratable acid and the quantities of dissociated malates. In certain saps (possibly in all succulents) acid is never associated with acid salt, though varying quantities of acid salt and normal salt occur together in a mixture of a marked buffer character. The faculty of producing and accumulating acids varies greatly in succulents. It may stand in causal relation to the quantity of dissociated malates. Species vary greatly as regards the distance between the litmus and phenolphthalein points as shown by titration, older leaves sometimes exceeding younger ones in this respect, and the quantity of aluminum malate appearing to be influential in this respect. Sap from seedlings of lupines (*Lupinus albus*) showed nearly uniform values for the concentration of hydrogen ions. Fluid from nonstimulated pitchers of Nepenthes showed indefinite concentrations of hydrogen ions as contrasted with the fluid from pitchers subjected to stimulus. By means of lacmoid paper an approximate value is obtainable for the concentration of hydrogen ions in a liquid when such concentration falls within certain limits.

A study of stomata, L. Rehfous (*Bul. Soc. Bot. Genève, 2. ser., 9 (1917), No. 4–6, pp. 245–350, figs. 135*).—The author gives an extended account of

studies on stomatal characters and related phenomena as carried out in a number of families of plants.

It is held that stomatal structure in a given natural group possesses a remarkable fixity, being an expression of ancestral characters rather than of local and temporary adaptations. The characters marking some families are cited as illustrating this fact. The Polypodiaceæ are thought to constitute a special group in some respects. A striking analogy is noted between the stomatal characters of Cycadaceæ and those of conifers.

The nature of tendrils and the formation of branch nodes, Y. Oinoue (*Bul. Inst. Oinoue, Num. Extra, 1917, pp. 27, figs. 42*).—The author concludes from the study here described that tendrils are anticipatory buds transformed into tendrils during the course of evolution. Bifurcation of a branch is simply a vegetative partition of the tip due to surplus vigor in the part. The probable course of ancestral development in these parts is briefly traced.

Slow changes in buried grapevines, E. Pantanelli (*Staz. Sper. Agr. Ital., 49 (1916), No. 12, pp. 605–648, pls. 4*).—Tests with varieties of grapevines are outlined with a brief account of the results, which indicate that Rupestris is very resistant to decomposition after the death of the tissues. The most characteristic change is humification, affecting the protoplasmic contents of the cells. Maceration is most rapid in the parenchyma. Aeration favors humification. The invasion of microorganisms, especially of fungi, accelerates the process, which is hindered by sterilization in the autoclave. Changes in the chemical contents are also indicated.

A method of prophesying the life duration of seeds, J. F. Groves (*Trans. Ill. Acad. Sci., 8 (1915), pp. 133–136, fig. 1*).—This is a continuation of the work previously noted as done by the author with Crocker (E. S. R., 33, p. 128). Turkish Red wheat was employed in these two series of tests.

Increased time of heating shows a delay in germination as well as a fall in germination percentage, which is also true of seeds stored for a long time at room temperature. A comparison of the life duration at various temperatures, as found by experiment with the calculated life duration, shows a close agreement between the two sets of values. It is thought, therefore, that the time-temperature formula for protein coagulation may be applied as a formula for the temperature-life duration for seeds; though, in order to establish the general application of this principle, much more work is regarded as needed and several influential factors need to be considered, as outlined in the previous work.

Electromotive phenomena in plants, A. D. Waller et al. (*Rpt. Brit. Assoc. Adv. Sci., 86 (1916), p. 305*).—The object of the work of this year, as reported by the committee, was to determine whether or not a sufficiently strong electrical response is obtained by employing the whole seed in germination tests. Results are given of six tests with the whole pea and with the extracted radicle, showing that the response of the radicle was much greater in the latter than in the former.

Experimental studies in the physiology of heredity, F. F. Blackman et al. (*Rpt. Brit. Assoc. Adv. Sci., 86 (1916), p. 306*).—In this report of the committee regarding the work of the year on *Primula sinensis*, it is stated that progress has been made in several directions. A new form has been produced, fulfilling a prediction previously made. The gap between the ordinary fully hoary type of stock and the wallflower-leaved variety is gradually being bridged by experimental breeding.

Studies of inheritance in Pisum.—II, The present state of knowledge of heredity and variation in peas, O. E. White (*Proc. Amer. Phil. Soc., 56 (1917), No. 7, pp. 487–588*).—The object of the present bibliographical review

is to summarize the large amount of knowledge recently gained and to correlate this with that which was available at the time of Lock's summary in 1908 (E. S. R., 20, p. 629), in order to show the progress made and to indicate what really is the basis of the Mendelian analysis of Pisum. Thirty-six hereditary factors as recognized and represented are dealt with and the available data are interpreted.

Biocharacters as separable units of organic structure, H. F. Osborn (*Amer. Nat., 51 (1917), No. 608, pp. 449–456*).—The purpose of this synopsis is said to be to bring together and review some of the noteworthy phenomena of character separability as contrasted with those of interdependence, cooperation, correlation, and coordination. The author proposes the term biocharacters as the general designation of the character unit in the organism. These are discussed as observed in paleontology, and also in regard to their modes of separability in heredity, in genesis, and in rate of evolution of forms.

It is claimed that biocharacters are separable in origin, development, evolution, and heredity. They are separable through their many modes of origin from the germ, either saltatory, gradational, or continuous. They have different rates of motion, or velocity, in individual development (ontogeny), exhibiting acceleration or retardation. They have different rates of evolution in different phyla, again exhibiting acceleration or retardation. All the biocharacters cooperate through different modes of grouping in functional correlation, in compensation, and in sex linkage. In the hard parts of the body, while the biocharacters of form and proportion may originate through continuity, through saltation, or through minute gradations, all the known evolution of proportion biocharacters is continuous. In the hard parts the biocharacters of rectigradations have been observed to originate and develop only through continuity.

Studies on self-sterility.—I, The behavior of self-sterile plants, E. M. East and J. B. Park (*Genetics, 2 (1917), No. 6, pp. 505–609*).—This investigation and the conclusions therefrom have been limited to the self-sterile species *Nicotiana forgetiana*, *N. alata*, *N. glutinosa*, and *N. angustifolia* bred among themselves, all questions connected with the relation between true self-fertility and self-sterility being considered as constituting a distinct problem.

The tendency to self-sterility is regarded as inherited, these four species breeding true to the quality. This is expressed in these plants from the beginning of the flowering season, though toward its close some self-fertility may be shown, especially in plants exhibiting the effects of adverse environmental conditions. This phenomenon, which is called pseudo self-fertility, is considered as a noninherited fluctuation. Self-sterility, whatever its nature may prove to be, is regarded as only a physiological impediment to self-fertilization. The fact that the waning of the reproductive period affects *N. alata* and *N. glutinosa* more markedly than the other two species is regarded as indicating multiple allelomorphism in a fundamental factor, the presence of which is necessary to the development of self-sterility. Cross-sterility, identical in its nature with self-sterility, was found in every population of self-sterile plants tested. Self-sterility behaves as a sporophytic character. Part or all of the individuals resulting from one mating may be fertile with one or both parents. It is stated that if A is sterile with B and C, the last two will be sterile when bred together. A varied series of facts observed in this connection is detailed, with discussion.

Ecology and physiology of the red mangrove, H. H. M. Bowman (*Proc. Amer. Phil. Soc., 56 (1917), No. 7, pp. 589–672, pls. 6, figs. 3*).—This is an account of the discussion of a study carried on since 1915 by the author on the red mangrove, *Rhizophora mangle*, which is claimed to be a plant of economic importance (E. S. R., 37, p. 821).

The thickenings of the cortex cells of the submerged absorptive roots are claimed to be really artefacts due to a slight shrinkage of the walls of the delicate transfusion cells. The pollen shedding device is explained. The endosperm is considered as a placental organ rather than as reserve material. The high mortality in specially concentrated media is due in H_2S mud cultures to increased hydrogen ion concentrations, and in hyperconcentrated sea water to the difficulty of absorption and retarded metabolism. In moist soil cultures the transpiration rate is delicately balanced by available soil moisture. No definite inverse proportion was maintained between tannin and dextrose during the growth of the seedling. Tannase tests seemed to show that tannin does not serve as reserve food in the hypocotyl. Red mangrove is facultative as regards its growth in fresh or salt water, though it requires the latter for its optimum development.

A cyanogenic Mucor, H. GUYOT (*Bul. Soc. Bot. Genève, 2. ser., 9 (1917), No. 1–3, pp. 30–35*).—A further account is given of the fungus previously reported (E. S. R., 36, p. 734), which is now technically described as a new physiological species, *M. cyanogenes*.

A comparison of certain Rocky Mountain grasslands with the prairie of Illinois, G. D. FULLER (*Trans. Ill. Acad. Sci., 8 (1915), pp. 121–130*).—The author makes some comparisons between Rocky Mountain grasslands and the prairies of Illinois. He states that these regions agree as regards conditions of rainfall and humidity and as regards summer deficiency in soil moisture, both showing a well-marked hydrarch succession passing from the aquatics through the sedge moor in a closely comparable series of associations, and both possessing a climax prairie meadow association in which herbaceous species other than grasses are fairly abundant. The two regions differ in altitude, temperature, length of growing season, and soil. The mountain region shows fewer aquatic species and a xerarch succession comparable to nothing noted in Illinois.

A study of the vegetation of southeastern Washington and adjacent Idaho, J. E. WEAVER (*Univ. [Nebr.] Studies, 17 (1917), No. 1, pp. 114, pls. 19, figs. 17*).—This is an account of ecological observations made during 1912 to 1914 on the three principal plant formations and subdivisions thereof occurring in this region.

The vegetation of Paraguay, R. CHODAT and W. VISCHER (*Bul. Soc. Bot. Genève, 2. ser., 9 (1917), Nos. 1–3, pp. 55–107, figs. 46; 4–6, pp. 165–244, figs. 60*).—Some results are detailed of the work of a Swiss expedition for botanical study in Paraguay, this account being confined to the Malpighiaceæ, the Podostemaceæ, and the Bignoniaceæ.

FIELD CROPS.

Cropping systems for the moister portion of eastern Washington and Oregon and northern Idaho, L. W. FLUHARTY (*U. S. Dept. Agr. Bul. 625 (1918), pp. 12*).—Three and four year crop rotation systems are outlined in which clover is substituted for the common summer-fallow method of growing cereals in the region adjacent to the Bitter Root and Blue Mountains in Washington, Oregon, and Idaho. This region has an annual rainfall of 20 in. or more, and comprises an area of approximately 1,875,000 acres of improved farm land. A farm survey made in 1915 on 246 farms in a representative portion of the district showed that 30.2 per cent of the rotation area was idle each season as summer fallow, while observations on a few farms where clover was employed in the rotation as a substitute for summer fallow showed an increase per acre in crop yields following this practice of from 15 to 25 per cent.

A study of the effect upon the profitableness of farming of different amounts of idle land in summer fallow indicated that the interest on investments varied from 5.9 per cent on farms having 46.5 per cent of the rotation area in summer fallow to 8.3 per cent for those having only 6.4 per cent of the area idle, with respective labor incomes of —\$200 and \$490. With respect to the per-acre yield of crops, the interest on investments varied from 5.5 per cent for an average crop index (crop yield as compared with average of all farms taken as 100) of 79 to 8.2 per cent for a crop index of 122, with labor incomes of —\$220 and \$480, respectively. It is concluded, therefore, "that any cropping system which either will increase yields or reduce the amount of land devoted to summer fallow without decreasing the crop yields will materially increase farm profits on these farms."

The effect on crop yields of eliminating summer fallow is noted as indicated by a farm survey made in 1912 on 144 silt loam soil farms in the Willamette Valley, Oreg. The crop index for farms without summer fallow was found to be 101, as compared with 96 for farms with summer fallow, wheat being the only crop to produce more per acre with summer fallow than without it. The introduction of legumes, principally clover, into the rotation was regarded as the determining factor in these results, the crop index ranging from 82.8 for farms with no legumes to 111.4 for those with 44.8 per cent of the crop area in legumes. In a study of the field crop area in clover in relation to farm profits and yields, the average labor incomes varied from —\$135 to \$560, and the crop index from 95.8 to 110.7, for farms with no clover and those with 32.7 per cent of the field crop area in clover, respectively.

Clover seeded with four different nurse crops produced a successful stand on 75.9 per cent of the area seeded in winter wheat, on 96.5 per cent of that seeded in spring wheat, on 89.7 per cent of that seeded in oats, and on 97.8 per cent of that seeded in barley. The principal factors contributing to the failure of clover seeded with a nurse crop are said to be foul land, poor seedbed preparation, too thick seeding of the nurse crop, poor seed, late seeding, and lack of proper soil inoculation. The pure culture and the field soil methods of inoculating clover are briefly described, and the production of clover for seed is discussed.

Crop rotation investigations.—Field T experiments, A. C. Arny (*Minnesota Sta. Bul. 170 (1917), pp. 3–55, figs. 3*).—This reports the results of crop rotation experiments extending over a period of six years, 1909 to 1914, inclusive, and embracing a study of different cropping systems, tests of commercial fertilizers in addition to barnyard manure for good rotations, and observance of methods of tillage and manuring. Rotations of 2, 3, 4, 5, and 7 years' duration were inaugurated, employing wheat, oats, corn, potatoes, flax, and timothy and clover for hay and pasture, and are compared with continuous cropping schemes, including oats, wheat, oats and wheat mixed, corn, and mangels. With certain exceptions, manure has been applied to each rotation and cropping system at the rate of 2 tons per acre per year. The fertilizer experiments were conducted on a standard 3-year rotation of oats, clover for hay, and corn, and included tests of complete commercial fertilizers, used with and without manure, and of raw rock phosphate, acid phosphate, muriate of potash, and nitrate of soda used singly with 6 tons of manure per acre. The same standard rotation was employed for the tillage and manure experiments, and the usual method of tillage, fall plowing the meadow for corn, and double disking corn land for oats, was adopted as a standard and compared with spring plowing for corn and fall and spring plowing for oats. Observations were also made of rotations without manure, of manure applied to the meadow, of pasturing off the grass, and of

broadcasting *v.* drilling grass and legume seed with grain. Considerable tabulated data are presented and fully discussed, showing both crop yields and crop values for the various treatments outlined.

The results may be summarized as follows: Rotations of grains, clover and timothy hay, and cultivated crops, with moderate applications of manure, have maintained yields, and with one exception returned a net income of $8.76 or over per acre. Cropping systems of different grains alternated, or of grain and corn alternated with moderate applications of manure but without clover, have not maintained yields, although an average net income of $7.75 per acre was realized. The yields of grain and corn grown continuously, with moderate amounts of manure, have been consistently lower than those obtained in the better rotations, and somewhat lower than those secured from rotations of grains only or grains and cultivated crops only. The average net income per acre has been $2.84 for wheat, $5.15 for oats, and $8.95 for corn. A 4-year rotation of oats, wheat, clover hay, and corn showed increased yields over the same crops grown continuously of 13.7 per cent for corn, 14.95 per cent for oats, and 30.98 per cent for wheat, and increases in the net income per acre of 29.2 per cent, 35.2 per cent, and 72.3 per cent, respectively. Mangels grown continuously with annual applications of 6 and 12 tons of manure per acre, respectively, did not in either case yield a product equal to the cost of production.

An average net return of $11.95 per acre was obtained from a 3-year rotation of oats, clover hay, and corn, with 6 tons of manure per acre applied preceding the corn crop. A complete commercial fertilizer in place of the manure gave practically the same yields, but at a financial loss of $3.44 per acre. Raw rock phosphate, acid phosphate, muriate of potash, and nitrate of soda applied singly, in addition to the manure, resulted in losses amounting to $4.59, $3.77, $4.83, and $11.37 per acre, respectively. A complete fertilizer used in addition to the manure resulted in a loss of $8.84 per acre.

A consistent lowering of corn yields during the last four years of the experiment was observed in the rotation without manure. Manure applied to meadow, in the spring of the year and preceding corn, failed to increase appreciably the hay yield and resulted in a lowering of corn yields. Pasturing off the grass crop as compared with removing two hay crops gave no increase in yield of oats or corn. There was no appreciable difference in the yields of corn on fall or early spring-plowed clover sod, although fall plowing is deemed the better farm practice. Oats were not so satisfactory on double-disked spring-plowed corn land as on double-disked fall-plowed land or as on corn land double disked only. On weedy, infertile, or compact corn land, plowing for grain crops is deemed preferable to double disking only. The stands of clover and timothy and the yields of hay were less satisfactory when sown with oats on double-disked spring-plowed corn land than on double-disked fall-plowed land or on land double disked only. Yields of hay from clover and timothy sown broadcast averaged 2.65 tons per acre, while that drilled with the grain, in a 3-year rotation, averaged 2.89 tons.

The author concludes from these results that "adopting a systematic rotation of crops in which is included clover and timothy for hay or pasture will ordinarily result in as large a total yield of grains and corn each year as formerly, when the acres were cropped largely to grain and corn only. The net income per acre from the grains and corn grown in rotation with clover or similar legumes may be expected to be higher than from the same crops grown continuously or in rotations not including clover."

[Report of field crops work in Hawaii], F. G. KRAUSS (*Hawaii Sta. Rpt. 1917, pp. 29–31, pl. 1*).—Field tests with leguminous and nonleguminous crops

for forage and green manure are noted as conducted both at the demonstration farm at Haiku and in cooperation with farmers. The crops used in these tests included cowpeas, velvet beans, peanuts, soy beans, alfalfa, pigeon peas, jack beans, Japanese cane, Sudan grass, *Paspalum dilatatum*, and corn.

Among the most promising cowpea varieties are the Brabham and Iron for forage and green manure, the Groit and Taylor for seed, and the Whippoorwill as a general-purpose sort. The Brazilian velvet bean, the Improved Valencia peanut, the jack bean, and the pigeon pea are said to be well established. Alfalfa did not thrive on the raw uplands, but of 10 varieties tested smooth and hairy Peruvian gave the most promise. All varieties responded to liberal manuring and fertilizing with phosphate, but liming and artificial inoculation appeared to have no beneficial effect. Japanese cane and Paspalum are deemed preferable to Sudan grass, due to the susceptibility of the latter to rust.

Corn sown in 30-in. rows on a medium loam soil and receiving about 60 tons of green manure in the course of three years and 500 lbs. of high-grade fertilizer at seeding time produced at the rate of 100 bu. per acre, as compared with an average yield of about 35 bu. per acre on virgin soil. Slightly less than one-half of the yield of the 30-in. rows was obtained from corn sown in 60-in. rows with all other conditions identical. This difference in yield is thought to be due to the added protection against strong winds afforded by the narrow spacing.

Tests were made with grain sorghums, millets, buckwheat, and sunflower for chicken feed and with wheat, oats, barley, and rye, the last proving totally unsuited to local conditions.

A strain of Bliss Triumph potato has been developed, and is said to be well established in the Kula potato district. More than 50 per cent increase in yield resulted from spraying with Bordeaux mixture.

Report of [field crops work at] the Glenwood substation, J. B. THOMPSON (*Hawaii Sta. Rpt. 1917, pp. 42–48, pls. 2*).—Field tests with various crops to obtain suitable forage for dairy cows are reported in continuation of work previously noted (E. S. R., 37, p. 132), and additional work is described on the development of blight resistant strains of potatoes for the Glenwood section.

The area planted to *Paspalum dilatatum* was extended at an estimated cost of $11.25 per acre, the relatively high initial cost being deemed justified by the permanent nature of the grass. The common bamboo grass (*Panicum palmifolium* or *Chætochloa palmifolia*) is said to possess considerable value as a forage crop, being extremely palatable to stock. It is a prolific seed bearer. With clean cultivation and fairly liberal applications of stable manure, this grass gives promise of very satisfactory yields during the cold season, one crop harvested from a small area yielding at the rate of 23.5 tons per acre. Canada field peas have proved to be of value when planted during the cool season of the year on soil treated with heavy applications of stable manure. Improved Swedish oats sown November 20, 1916, on soil which had received about 50 tons of stable manure per acre, produced approximately 24 tons of green feed when cut on April 9, 1917. Subsequent plantings made on December 12 and 28, 1916, and on January 16, 1917, are said to have given excellent returns. Spelt and spring rye produced yields of green feed of 15,687 and 17,430 lbs. per acre, respectively, after a growing period of 4.5 months. Both crops were badly infested with aphids, and are not deemed comparable to oats. Thousand-headed kale and Dwarf Essex rape drilled in rows on November 20, 1916, and transplated on January 5, 1917, made a vigorous growth during the cold season and yielded at the rate of 19.5 and 22 tons of green feed per acre, respectively. A planting of Dwarf Essex rape made in April was totally destroyed by cutworms. Seedings of different species of bur clover were made in November, 1916, and included *Medicago scutellata*, *M. orbicularis*, *M. arabica*, *M.*

hispida, *M. hispida sardoa*, and *M. tuberculata*. *M. scutellata* was the first to reach maturity, but is described as ranking lowest in forage production.

Two varieties of potatoes of the so-called "Hamakua Hybrid" designated as Blue Ribbon and White Ribbon, respectively, were grown in comparative tests for blight resistance with Portuguese Red and five common white varieties. The hybrid varieties and the Portuguese Red exhibited a marked degree of resistance and outyielded the white varieties in every instance.

Report of the agronomy division, C. A. Sahr (*Hawaii Sta. Rpt. 1917, pp. 48–55, pl. 1*).—This reports the continuation of previous work (E. S. R., 37, p. 131).

In a study of soil aeration with rice, the increases favoring nonaeration in 1916 were 18.7 per cent for the spring crop, and 4.9 per cent for the fall crop, and in 1917 3.1 per cent for the spring crop.

Plantings of Burbank and Early Rose potatoes produced average yields of but 0.47 lb. per hill for both varieties, due to an attack of mites and to dry weather. Three varieties of sweet potatoes were propagated for cuttings for distribution.

Individual yields of alfalfa varieties, based on 9 cuttings per annum for a period of 32 months, were obtained as follows: Utah Common 30 tons of green forage per acre, Kansas Common 28.4 tons, Peruvian 21.7 tons, and Turkestan 14.7 tons. From the same number of cuttings for a period of 28 months, yields of Grimm, dry-land, and common alfalfa were obtained amounting to 26.6, 26.4, and 9.3 tons per acre, respectively.

Tests with tepary beans for seed have given varying results. A fall seeding made a growth of 9 in., the plants dying before reaching maturity, while a second seeding drilled in rows 1.5 ft. apart failed to fill the space between the drills, but yielded at the rate of 10 bu. of shelled beans per acre. In a third test made under drier conditions, with the beans drilled in rows 2 ft. apart at the rate of 15 lbs. per acre, the crop attained maturity in 76 days and yielded at the rate of 33.4 bu. per acre.

A new variety of pigeon pea introduced from India is said to have given favorable results.

Brief notes are given on limited field tests with various grasses including *Polytrias præmorsa*, blue couch (*Digitaria didactyla*) Napier (*Pennisetum purpureum*), Wilder, fuzzy top, Australian blue, and Natal redtop. In sorghum variety tests Sugar Drip was again first in yield of both grain and forage. Nut grass control by spraying with a solution of 1 lb. of white arsenic and 0.5 lb. of caustic soda in water to make 20 gal. when the plants were in full bloom necessitated treatments at average intervals of 40 days the first year and 65 days the second year. The third year, an interval of 9 months has elapsed since the last spraying without the appearance of any blooms.

Variety and fertilizer tests with corn failed completely due to severe attacks by the leaf hopper (*Peregrinus maidis*), although the infestation was sufficiently controlled by means of parasites (*Ootetrastichus* sp.) to obtain a crop of sweet corn, the yield being at the rate of 43 bu. per acre.

Small plantings of edible canna yielded at the rate of 23 tons edible tubers, 20.5 tons immature tubers, and 20.25 tons forage per acre.

A white sweet variety of cassava from Trinidad and a red bitter sort common to the islands, planted in the summer of 1915 and harvested in March, 1917, yielded at the rate of 31 and 16.25 tons fresh roots per acre, respectively.

A study of forage-crop problems was begun in July, 1916, on the military reservation at Castner, Oahu, and experimental plantings were made of numerous leguminous and nonleguminous forage crops. Chemical soil analyses showed from 1.24 to 6.02 per cent of manganese dioxid in the surface soil

(first foot) and from 0.7 to 3.67 per cent in the subsoil (second foot). Of the crops sown in the summer only pigeon peas and Japanese cane made satisfactory growth, all others failing completely after a period of about 70 days' stunted growth. Fall seedings resulted in good stands, but no better growth was made than in the case of the summer plantings, except on small scattered areas where brush piles had been burned. The stimulated growth observed on these areas led to rather extensive studies of the effect of burning brush in ditches and on the level surface of these soils and incorporating the ashes with the soil. A comparative test of stable manure applied at the rate of 33 tons per acre in ditches 1 ft. deep and rolled level was also included. Various crops, numbering 45 in all, and including grasses, oats, wheat, Japanese millet, edible canna, sorghums, cassava, and legumes, were grown on soils receiving the various treatments, and the resulting growth is indicated in tabular form on a basis of 100 per cent for normal growth under normal soil and moisture conditions. The best average results for all crops were obtained from the manured plats, while burning over the ditched and level soil resulted in increased production over the untreated checks for practically all the crops. Observations are also noted on the effect of iron compound sprays on the various forage crops grown on manganese soils. Alfalfa sprayed with copperas every two weeks during April and May showed a slight effect previous to a cutting made June 2, but not on later growth, while on Japanese cane the effects were quite marked.

Progress report, Substation No. 7, Spur, Tex., 1909 to 1914, R. E. DICKSON (*Texas Sta. Bul. 218 (1917), pp. 7–33, figs. 7*).—This reports the results of variety and cultural tests with alfalfa, Sudan grass, grain and forage sorghums, cotton, corn, small grains, and cowpeas; and of field experiments on time and methods of seed-bed preparation, and on manuring. The average annual precipitation for the 20-year period 1895 to 1914, inclusive, was 21.73 in., of which 15.17 in. fell during the six summer months. The average date of the last killing frost in the spring was March 18, and the first in the fall, October 25, for the period 1911 to 1914, inclusive. Much of the experimental work reported was conducted during 1914, when a total precipitation of 34.63 in. obtained.

The successful production of alfalfa is deemed the most important contribution of the substation to the agriculture of the State, a 4-year-old field giving a total yield of 3.74 tons of hay per acre in 1914. Fall seeding is said to be much more desirable than spring seeding. In the fall of 1913 alfalfa sown in close drills and in 18 and 36 in. rows showed average yields amounting to 2.27, 1.42 and 1.22 tons of hay per acre, respectively. Yields of cured hay, ranging from 1.72 tons for Province to 2.96 for Turkestan, were obtained in variety tests conducted during 1913–14. A seeding rate of 10 lbs. per acre is deemed amply sufficient on a well prepared seed bed, while excellent results are said to have been secured with a rate of 4 lbs. per acre.

Seeding Sudan grass for hay in 18-in. rows, broadcast, and in 36-in. rows resulted in yields amounting to 4.927, 4.551, and 4.204 tons per acre, respectively. A seeding rate of 14 lbs. per acre gave a slightly heavier yield, 5.14 tons of hay, than rates of 7, 18, 22, 32, or 40 lbs. Sudan grass was also grown in close drills and in 36- and 18-in. rows for seed in 1914, and resulted in yields of 989.5, 973.5, and 847 lbs. per acre, respectively. A seeding rate of 22 lbs. with a yield of seed of 1,209 lbs. was found to be superior to rates of 7, 14, 18, 32, or 40 lbs. per acre.

In grain sorghum variety tests, Dwarf Yellow milo, feterita, and Dwarf White milo gave average yields of 50.58, 40.58, and 37.32 bu. per acre, respectively. Red Kafir, with a yield of 15.46 tons of green forage per acre,

Kafir corn with 14.52 tons, and Dwarf Kafir with 14.27 tons were first in tests for silage production in 1914. In rate-of-seeding tests with Dwarf milo and Blackhull Kafir, the highest yields, amounting to 68.21 and 56.51 bu. per acre, respectively, were obtained with the plants 11.2 in. and 14.3 in. apart in 3-ft. rows. Milo maize and Kafir corn planted in 3-ft. rows produced 50.53 and 46.28 bu. per acre, respectively, as compared with yields of 46.45 and 30 bu. when planted in 6-ft. rows. Date-of-planting tests with milo maize showed yields ranging from 51.59 bu. for plantings made May 7 to 21.44 bu. for those made July 15. Variety tests with saccharin sorghums resulted in maximum yields of 6.068 and 6.051 tons of cured roughage per acre for Orange and Sumac, respectively. Further tests of the same varieties for silage showed yields of green forage amounting to 15.79 tons per acre for Sumac and 14.46 tons for Orange.

Cotton variety tests conducted during 1912 and 1914 showed average yields of seed cotton ranging from 703.4 lbs. per acre for long staple to 1,003.57 for Cleveland Big Boll. Based on factors other than yield, Lone Star and Mebane Triumph are deemed best for local conditions, pending further trial. Half-and-Half is regarded as decidedly inferior to these varieties. The highest yield of lint cotton, 573.69 lbs. per acre, obtained in rate-of-thinning tests was secured with the plants thinned to 16 in. apart in 36-in. rows.

June corn and yellow dry-land corn grown during 1914, an unusually favorable year for corn in this region, gave yields of 29.2 and 7.9 bu. per acre, respectively. Variety tests with wheat, barley, emmer, rye, and oats are held to indicate that the winters are usually too long and dry for the successful production of small grains. Turkey, Kharkof, and Crimean winter wheats and Tennessee winter barley are regarded as showing some promise.

New Era and Early Buff cowpeas, with yields amounting to 12.22 and 12.6 bu. of seed per acre, respectively, are deemed best for this locality.

Date-of-plowing tests for seed-bed preparation are described and are held to indicate the need of early seed-bed preparation. Cotton yields varied from 753.84 lbs. of lint cotton per acre for November 21 (1913) plowing to 593.29 lbs. for April 2 (1914) plowing; yields of Sumac sorghum for hay varied from 7.1 tons for February 2 plowing to 6.02 tons for April 2 plowing, and for silage from 19.69 to 17.25 tons per acre, respectively; and yields of cowpeas from 10.41 bu. of seed per acre for the February 2 plowing to 7.5 bu. for the April 2 plowing. Various methods of seed-bed preparation for milo maize were tested, the highest grain yield, 73.9 bu. per acre, being obtained from fall-listed plats, and the highest yield of green forage, 16,300 lbs., from plats fall-plowed 6 in. deep. Spring listing, as compared with January plowing, 3, 6, and 9 in. deep, for cotton resulted in yields of lint cotton amounting to 589.21 lbs. per acre for the former method and a maximum yield of 548.15 lbs. for January plowing 3 in. deep. Fall plowing as compared with fall listing for cotton gave average yields amounting to 737.51 and 734.57 lbs. of seed cotton per acre, respectively.

Applications of 2 tons of manure per acre to feterita gave yields of grain amounting to 39.73 bu., and of dry forage of 14,196 lbs. per acre, as compared with yields of 35.09 bu. of grain and 13,512 lbs. of forage, respectively, from unmanured plats.

Progress report, Substation No. 8, Lubbock, Tex., 1909 to 1914, R. E. Karper (*Texas Sta. Bul. 219 (1917), pp. 5–36, 39–41, figs. 7*).—This reports the results of variety and cultural tests with grain and forage sorghums, corn, Sudan grass, millet, cotton, cowpeas, peanuts, broom corn, wheat, oats, and barley; field trials of legume and nonlegume mixtures for hay, and of alfalfa, sweet clover, and beans; and soil-fertility tests with feterita and cotton. The substation is located at an altitude of approximately 3,200 ft., and for the

4-year period of 1911 to 1914, inclusive, had an average annual rainfall of 20.32 in., 75 per cent of which fell during the growing season, April to September, inclusive. Data for three years indicate that the average date of the last killing frost in the spring is April 8, and of the first killing frost in the fall, November 1. The experimental work reported covers the period 1912 to 1914, inclusive.

In variety tests with grain sorghums, the average yields of all varieties tested amounted to 32.66 bu. for feterita, 30.25 bu. for Kafir corn, and 28.79 bu. for milo maize. The dwarf varieties are deemed superior as indicated by average yields for 1913 and 1914 of 40.3 bu. per acre for Dwarf milo, 36.9 bu. for feterita, and 35.4 bu. for Dwarf Kafir. Spacing tests with these three crops conducted during 1914 showed average yields ranging from 36 bu. per acre for plants 6 to 7 in. apart in 36-in. rows to 57.4 bu. for spacings of 2 to 3 in. Similar tests with Dwarf milo in 1913 and 1914 resulted in average yields of 39.75 bu. for 3 to 4 in. spacings, 32.75 bu. for 5 to 6 in. spacings, and 28.7 bu. for 7 to 8 in. spacings. Feterita and milo maize grown alone in 3 and 6 ft. rows and in pairs of 3-ft. rows with 6 ft. between pairs, as compared with growing the crops with cowpeas sown in the interspaces, showed an average loss of grain of 5.6 bu. per acre and an average gain in cowpea hay of 356 lbs. per acre. It is concluded that the practice of mixed planting is not profitable for early grain sorghums in this locality.

Corn varieties grown on the substation in 1914 showed a variation in yield of from 18.5 bu. for Brown County Yellow Dent to 54.6 bu. per acre for Mexican June. The average yield of all grain sorghums tested for the period of 1912 to 1914, inclusive, amounted to 31.92 bu. per acre, as compared with 20.94 bu. for Mexican June corn for the same period.

In comparisons of Sudan grass and Tunis grass for forage, made in 1914, Sudan grass outyielded the latter in every case, showing a total average increase in yield of 0.85 ton per acre. Millet proved to be much inferior to Sudan grass. Seeded in 36-in. rows at different rates of seeding, Sudan grass produced yields of hay ranging from 3.9 tons for a seeding rate of 1.3 lbs. per acre to 4.45 tons for a rate of 6.9 lbs. Seeded in close drills, it produced 2.36 tons of hay per acre, and in 36-in. rows 2.35 tons, while for the two years 1913 and 1914 the highest average yield, 3.85 tons per acre, was obtained from plantings in 18-in. rows. In date-of-seeding tests the maximum yield for 1913, 3,542 lbs. of hay, was secured from plantings made May 15, and for 1914, 9,941 lbs., for plantings made April 10. Sudan grass grown in rows for seed produced yields ranging from 294 to 910.5 lbs. per acre.

Maximum yields of millet were obtained from seedings in close drills, and amounted to 2,062.5 lbs. for White Proso in 1913 and 3,437.5 lbs. for Yellow Proso in 1914. German millet seeded in 36-in. rows and in close drills produced 1.5 and 1.49 tons of hay per acre, respectively. Seeded in close drills it produced 2,983 lbs. of hay per acre during 1912 and 1914, as compared with a yield of 4,855 lbs. for Sudan grass seeded in 36-in. rows.

Variety tests with 14 saccharin sorghums conducted during 1914 resulted in maximum yields of green forage of 43.780 lbs. per acre and of dry forage of 18,700 lbs. for Sumac. This variety was also highest in limited tests conducted during the period of 1912 to 1914, inclusive, with an average yield of 7,347 lbs. of dry forage per acre. Tests for seed production in 1914 resulted in maximum yields of 69.87 and 68.64 bu. per acre for Planters and Sumac, respectively. Sumac seeded in close drills at rates of 2 and 4 pk. per acre showed average yields of 7,947 and 7,675 lbs. of forage per acre, respectively.

Cowpeas and saccharin sorghums planted together in 36-in. rows and in close drills produced average yields of 5,487 and 3,084 lbs. of forage per acre, re-

spectively, while seedings of 6:1 and 4:1 mixtures of cowpeas and sorghums resulted in average yields of 4,057 and 4,524 lbs. per acre, respectively. Rate-of-seeding tests in close drills with a 4:1 mixture resulted in average yields of 3,721 lbs. of cured forage per acre for a 60-lb. rate and 3,609 lbs. for a 30-lb. rate. For the two years 1913 and 1914, the maximum yield, 4,207 lbs. was obtained from a 60-lb. rate. Tests of various planting rates of a 4:1 mixture sown in 36-in. rows showed a maximum yield of 7,186 lbs. of forage per acre for a 19-lb. rate of seeding. A mixture of 6 parts cowpeas to 1 part Sudan grass seeded in 4, 6, and 8 pk. rates produced 3,300, 2,950, and 3,350 lbs. of cured hay per acre, respectively. Seeded alone at a 12- and 30-lb. rate, Sudan grass gave respective yields of 1,764 and 2,887 lbs. of hay per acre, but when sown with 60 lbs. of cowpeas it produced only 1,056 and 2,039 lbs. of hay per acre, respectively. It is concluded that a mixed cropping system is inadvisable, it being deemed more profitable to produce the crops separately and mix them when fed.

Burnett and Mebane Triumph, with respective yields of seed cotton of 1,199.5 and 980.4 lbs. per acre, were highest in cotton variety tests. In rate-of-thinning tests with two varieties during 1912 to 1914, inclusive, and with 3 varieties during 1913 and 1914, the highest yields were obtained from spacings of from 11 to 12 in. in 3-ft. rows, amounting to 883.19 and 1,399.53 lbs. of seed cotton per acre, respectively. Similar tests with 3 varieties in 1914 showed a maximum yield of 2,287 lbs. of seed cotton per acre for a spacing of 6 to 7 in., together with the highest number of bolls per pound of seed cotton, 78.4. The results, on the whole, are deemed rather inconclusive, although a stand of 12 in. apart in 3-ft. rows is regarded as satisfactory in this locality.

The highest yielding cowpea varieties were Khotan, with an average yield of 16.85 bu. per acre, and Old Bokhara, with 16.04 bu. Tests of different seeding rates of cowpeas sown in close drills for forage indicated that a rate of 6 to 7 pk. per acre was best for maximum production. Seeded in rows for forage, a rate from 18 to 20 lbs. gave the highest yield, 2,574 lbs. per acre. Average results for all methods of planting for the period of 1912 to 1914, inclusive, showed a yield of 2,949 lbs. of forage per acre for drill plantings and 2,472 lbs. for row plantings.

Peanuts are said to be successfully grown, as a rule, in this region, the Spanish variety having produced an average yield of 32.15 bu. per acre for a 3-year period.

Average yields of Tepary beans for 1912 and 1914 amounted to 17.67 bu. per acre. Navy beans and Extra Early Lima beans grown in 1914 gave yields of 5.6 and 16.73 bu. per acre, respectively.

Dwarf, Dwarf Standard, and Standard broom corn produced yields of cured, clean, stripped brush in 1912 of 198, 251, and 257 lbs. per acre, respectively, and of cured unstripped brush in 1913 of 1,622 and 2,355 lbs., respectively, for the first two varieties.

Cereal crops are regarded as rather uncertain except in seasons of abundant moisture supply, although rye, wheat, and emmer are said to make excellent winter pasture. Maximum yields in variety tests with small grains were obtained as follows: Burger, Malakof, Turkey, and Crimean winter wheats with 5.8, 5.4, 5.2, and 5 bu. per acre, respectively; Burt and Sixty-Day oats with 11.5 and 10.4 bu. per acre, respectively; Odessa and Caucasian barley with 10.25 and 9.65 bu. per acre, respectively; and rye with 10.8 bu. per acre.

Applications of 2 tons of manure per acre to feterita resulted in yields of 51.4 bu. for the manured plats and 49 bu. for the unmanured. Similar applications to cotton showed an average yield of seed cotton of 1,593.1 lbs. per acre as compared with 1,524.2 lbs. for the unmanured plats.

The identification of varieties of barley, H. V. HARLAN (*U. S. Dept. Agr. Bul. 622 (1918), pp. 32, pls. 4*).—This bulletin presents a scheme of classification of cultivated barleys, designed primarily for the use of experiment-station workers and advanced students in agronomy, and aims especially to coordinate previous schemes of classification, to render available work already published on barley, to suggest modifications for obtaining a more logical arrangement of the varieties, to add four new varieties discovered during the progress of the work, and to serve as a basis for a discussion of all the agricultural varieties of barley grown upon the farms in America.

In describing species and varieties, only the major characters were used, embracing six variable factors, namely, fertility, adherence or nonadherence of the flowering glume, outer glumes, terminal appendages of the lemma, color, and density. Less important characters were utilized in describing subvarieties. Keys are presented for the identification of the four recognized species of barley, viz: *Hordeum vulgare*, *H. intermedium*, *H. distichon*, and *H. deficiens*; of 32 varieties occurring under the four species; and of the subvarieties.

An alphabetical list of rejected species, subspecies, and varieties, also of synonyms which have been published from time to time, has been prepared because "in the analysis of the relative value of the variable characters of barley, a number of variations were regarded as of too minor a nature to be used even in the description of named subvarieties. These included the elevation of the hood on a short awn, awns produced on the hood itself, malformed awns, short awns, the nature of the hairs on the rachilla, the toothing of the nerves of the lemma, and the widening of only the two outermost glumes at a node. Varieties established upon these characters are not recognized in the key." A few groups founded on characters other than those just named have been included in the list. "The most important of these is probably that of compound spikes. The inclusion of compound spikes as a recognized character would simply double the number of varieties. In barley, proliferation of spikes is common, but in most strains it is not inherited. In others, while the tendency is transmitted, it is inherited imperfectly."

Distinction between colors and variations of density are not deemed sufficiently well established to be entirely satisfactory for use in taxonomic work, and are regarded as fields for further study.

The identification of thrashed barley by means of the keys is described, and in the common agronomic varieties the chance of error is said to be negligible.

A key has also been prepared listing a few well-known agronomic varieties of barley in each of the more common subvarieties, although no attempt is made to distinguish between the agronomic varieties within a subvariety. "In the varieties at present grown in America, separations are most difficult in the lax forms of the common 6-rowed barleys. In general, there are two groups, the Manchuria-Oderbrucker and the Coast. These groups are separated by the longer, heavier grain and the more tenacious awn of the latter. Within a group such as the Manchuria, identifications must be based on combinations of minor characters, such as the density of the spike, the nature of the hairs on the rachilla, the length of grain, and, if necessary, distinctive culm characters and the length of the growing season."

A list of 41 titles is appended, comprising the literature cited.

The agricultural situation for 1918.—VIII, Corn.—A large acreage of corn needed (*U. S. Dept. Agr., Office Sec. Circ. 91 (1918), pp. 16*).—This presents a general discussion of the relative importance of the corn crop and of means for increasing the acreage and yield per acre. The employment of improved implements in preparing the land and in planting, cultivating, and harvesting the crop is recommended in addition to the use of good seed, improved cropping

conditions, and the control of insect and other enemies. The utilization of the crop for human and stock food and as a raw material for the manufacture of numerous products is noted.

Method of sale of war emergency seed corn to farmers in certain States by the United States Department of Agriculture (*U. S. Dept. Agr., Office Sec. Circ. 105* (*1918*), *pp. 3*).—Directions are given for filing applications for seed corn by farmers in those sections of Ohio, Indiana, Michigan, Illinois, Iowa, Minnesota, Nebraska, Missouri, and Wisconsin where a shortage of viable seed is known to exist.

The seed-corn situation for 1918, W. L. Burlison and G. H. Dungan (*Illinois Sta. Circ. 211* (*1918*), *pp. 8, figs. 5*).—This describes the preparation and manipulation of the so-called rag-doll tester for seed corn, together with brief notes on the sawdust and sand box tester. Summarized data show that yields of corn from seed produced near Urbana (central Illinois) and grown at Urbana and at DeKalb (northern Illinois) have varied but little over a period of several years.

The agricultural situation for 1918.—V, Cotton.—Maintaining the supply of cotton (*U. S. Dept. Agr., Office Sec. Circ. 88* (*1918*), *pp. 34*).—The present status of cotton production throughout the world is reviewed, and the demands placed upon the United States for cotton and its by-products are noted.

Increased production per acre by employing superior varieties, including the substitution of long-staple upland strains wherever possible, and by adopting improved methods of culture is deemed more desirable than increased acreage. The relation of disease and insect enemies to cotton growing is discussed with special reference to the appearance and measures for control of the pink bollworm.

Factors entering into the marketing of cotton with regard to a proper grading and handling of the product are outlined, and the advantages of cooperation among producers to obtain uniform lots of cotton, to build gins and oil mills, and to employ expert graders are indicated.

Gin compression of bale cotton to a density of 33 lbs. per cubic foot, or compression to a density of from 35 to 37 lbs. by high-density compression, at terminal points, is recommended as a means of materially reducing the number of freight cars required to carry the crop. It is estimated that a car holding 30 bales of uncompressed cotton would hold 65 bales of ordinary railroad-compressed cotton or 115 bales of high density compressed cotton. Furthermore, by selling cotton in the bale by net weight it is claimed that the custom of adding surplus tare to bring the tare up to the full amount allowed would be eliminated, and that 2,200 less freight cars would be required to move a 12,000,000-bale crop.

The agricultural situation for 1918.—IX, Potatoes.—An ample supply of potatoes needed (*U. S. Dept. Agr., Office Sec. Circ. 92* (*1918*), *pp. 39, fig. 1*).—The potato is said to contribute about 13 per cent of our food material in normal times and to serve as a bread grain supplement or substitute, and for these reasons an adequate production at the present time is deemed most important. The crop of 1917, amounting to 442,536,000 bu., was the largest in the history of the country, while during the four years 1914 to 1917 the average acre yield ranged from 80.5 to 110.5 bu.

Field practices and cultural methods employed in the early-trucking regions of the South and Southwest, in the late or main crop region of the North and West, and in the irrigated regions of the West are described in considerable detail. The more important potato diseases and insect pests are noted, and appropriate control measures are outlined. The subjects of grading and marketing potatoes are also discussed.

Potato culture, T. B. HUTCHESON and T. K. WOLFE (*Virginia Sta. Bul. 217 (1917), pp. 16, figs. 5*).—This bulletin outlines cultural methods for potatoes based upon experimental work and observations made at Blacksburg on Hagerstown silt loam soil and deemed applicable to most of the soils west of the Tidewater area.

In tests of early, medium early, and late varieties of potatoes, the highest average yields for a 5-year period were obtained from Irish Cobbler with 152.06 bu. per acre, Early Rose with 170.36 bu., and Vulcan (3-year average) with 162.57 bu., respectively. Eye pieces and 0.5, 1, and 2 oz. seed pieces were employed in 3-year tests to determine the influence of size of seed piece on yield with average results of 43.93, 99.75, 148.13, and 172.53 bu. per acre, respectively. A comparison of sprouted and unsprouted seed made during 1915 and 1916 resulted in yields of 143.13 and 137.5 bu. per acre, respectively.

Potato fertilizers are briefly discussed, and notes on storage and on potato diseases and insect pests and their control are presented.

Black heart and the aeration of potatoes in storage, F. C. STEWART and A. J. MIX (*New York State Sta. Bul. 436 (1917), pp. 321–362, pls. 10*).—The accidental discovery that the exclusion of air from potatoes induced the production of black heart at temperatures much below those employed by Bartholomew (E. S. R., 35, p. 349) led the authors to undertake extensive investigations to determine the relation of the air supply to the occurrence of black heart, and also to determine the effect of storing potatoes in deep piles in cellars and bins and in unventilated pits and piles out-of-doors. Most of the experiments were made with sound washed and dried tubers placed in wide-mouthed glass museum jars having a capacity of 3,500 to 3,700 cc., and provided with tight-fitting ground glass stoppers which were hermetically sealed. To study the effect of storing potatoes in deep piles, tall galvanized iron cylinders 9 in. in diameter and from 80 to 126 in. in height were employed. These were left open at the top, but were air-tight at the sides and bottom. One experiment was made out-of-doors with piles of potatoes protected from freezing by a covering of oat straw and soil. The temperatures varied from 2 to 24° C. (35 to 75° F.). The experiments were conducted during April and May, 1914; from January to May, 1915; and from October, 1915, to May, 1916. The Sir Walter Raleigh was used throughout the investigation. The observations are fully discussed, and form the basis for the following summarized statement of the conclusions reached:

Potatoes can not long endure close confinement. Within a certain length of time, which varied with the temperature and quantity of air available, tubers confined in hermetically sealed jars became moist over a part or the whole of their surface, and if they were then exposed to the air the moist surface areas turned brown, and the color of the flesh changed first from white to pink and then to black. With a volume of air equal to the volume of the tubers, a confinement of 10 or 12 days was sufficient to produce the symptoms described provided the temperature was around 70° F. At a temperature of 55 to 60° about 20 days were required, and at 40° from 23 to 40 days. Tubers in half full and quarter full jars behaved similarly to those in full jars, except that the symptoms were slower in making their appearance. Tubers confined in sealed jars with less than about ten times their volume of air were unable to do more than barely start sprouts. For normal sprouting about 19 volumes of air per volume of tubers were required. Black heart may be expected to appear whenever the volume of air available to the tubers is less than that required for normal sprouting.

Different tubers of the same lot exhibited marked differences in susceptibility both to black heart and to surface discoloration. The cause of this has not

been determined. It appears doubtful that the size of the tubers is an important factor.

Data obtained from the experiments with tubers in deep tanks to determine how deeply potatoes may be piled with safety were deemed insufficient for the formulation of definite rules, but it appears that 6 ft. should be considered the maximum depth of piling when potatoes are to be stored for several months at temperatures below 45°, while at temperatures above 50° the depth limit should be 3 ft. if the potatoes are to be stored longer than three or four weeks. Tubers suffering from insufficient aeration through deep piling behaved in general like tubers in sealed jars, sprouting feebly or not at all, becoming moist on the surface, discoloring externally upon exposure to the air, and often being affected with black heart internally. The principal difference was in the occurrence of rotten spots caused by fungi and bacteria.

Black heart sometimes occurred in potatoes stored out-of-doors in pits, and was due to insufficient aeration, although the experiments indicate that the aeration of potatoes in unventilated pits is better than might be supposed and that the ventilation of small pits is unnecessary.

Injury resulting from insufficient aeration was due to the lack of oxygen rather than to the accumulation of carbon dioxid.

Tubers affected with black heart produced by exposure to high temperature usually appeared normal externally, while those affected with black heart produced by exclusion of the air usually showed more or less surface discoloration.

Insufficient aeration during storage did not cause spindling sprout, the tubers upon being supplied with air sprouting normally if at all.

Tubers severely affected with black heart are deemed unfit for seed purposes, but slightly affected tubers may be planted. If tubers are sound and normal in apparance, it is said to be unlikely that they have been injured for seed purposes by any storage conditions to which they may have been subjected.

The prevention of black heart is a shipping problem as well as a storage problem, as the trouble often results from the overheating of potatoes during shipment in stove-heated cars.

Poor ventilation injures stored potatoes, F. H. Hall (*New York State Sta. Bul. 436, popular ed. (1917), pp. 11, figs. 5*).—A popular edition of the above.

The agricultural situation for 1918.—VI, Rice.—Produce more rice for consumption and export (*U. S. Dept. Agr., Office Sec. Circ. 89 (1918), pp. 24, figs. 2*).—The value of rice for human food is emphasized and increased consumption in the United States urged. The production of rice in this country attained a maximum of from 36,000,000 to 40,000,000 bu. during the last two years, the consumption being about 90 per cent of the amount produced. Imports declined approximately 40,000,000 lbs. during the last three years, while exports increased about 139,000,000 lbs. for the same period. The largest acreage was seeded to rice in this country in 1917 and amounted to 964,100 acres, while it is estimated that millions of acres are well adapted to growing the crop. Aside from increased acreage, means for increasing the output of rice suggested include better methods of irrigation; proper seed bed preparation, seed selection, and method, rate, and time of seeding; the judicious use of fertilizers; the proper drainage of land for harvesting the crop; careful thrashing the eradication of weeds; and the control of insects and diseases affecting the crop.

The agricultural situation for 1918.—III, Sugar.—More beet and cane sugar should be produced (*U. S. Dept. Agr., Office Sec. Circ. 86 (1918), pp. 34, figs. 2*).—Stating that the world's annual shortage of sugar since the war began has been more than 2,000,000 tons, the possibilities of increasing the

sugar supply for 1918 by curtailing consumption of refined sugar and by maintaining and, wherever possible, extending the domestic cane and beet-sugar output are fully discussed. The measures outlined may be summarized as follows: The cane sugar supply may be maintained and increased by extending cane growing to suitable lands; by better cultural methods; by adopting a rotation system that will improve the soil; by the improvement of cane varieties through selection and breeding; by the control of diseases and insects; by utilizing to the best advantage the by-products (tops, leaves, bagasse, and molasses), including a combination of live-stock production with cane growing, thus utilizing tops and leaves for feed and increasing the supply of barnyard manure; by developing and extending the cane-sirup industry to provide a substitute for refined sugar and thus conserve the supply; by improving the methods of making sirup so that a better and more uniform grade will be produced and a wider and a more constant market obtained; and by producing raw sugar suitable for many household purposes.

Measures recommended for maintaining and increasing the beet-sugar output include the improvement of cultural methods; proper methods of crop rotation; a proper relation between sugar plants (beet or cane) and live stock, permitting the feeding of a larger supply of by-products (tops, pulp, and molasses), and the production of a larger supply of manure; a proper relation between mill capacity and quantity of raw material produced, so that a maximum mill run will be possible; the bringing under cultivation of suitable new areas not now productive, such as certain uncultivated Indian lands in Montana, Wyoming, and Idaho; the drainage of certain wet areas otherwise capable of producing profitable crops of beets; the development of new systems of irrigation in dry areas otherwise suited to sugar-beet culture and the extension of established irrigation systems in irrigated areas where sugar-beet growing is or may be carried on profitably; increasing the beet acreage in present beet areas by inducing more farmers to grow beets; harvesting the beets more carefully, so that there will be no waste of the sugar-containing part of the beet or of its by-product; developing satisfactory seeding and harvesting machines and other beet implements that will save labor and expense in producing and handling beets; the production of an adequate supply of high-grade sugar-beet seed; and the development of strains of sugar beets that will produce a greater tonnage of beets and yield a greater percentage of sugar.

The agricultural situation for 1918.—VII, Wheat.—More wheat is needed for home use and for the Allies (*U. S. Dept. Agr., Office Sec. Circ. 90 (1918), pp. 32*).—A general review of the wheat situation throughout the world with regard to acreage, production, and consumption is presented. The needs of England, France, and Italy are especially emphasized and the necessity and ability of the United States to meet these needs indicated.

The total supply of wheat for the year 1917–18 in this country is estimated to be 699,000,000 bu. and the demand of the Allies upon the United States, Australia, and India more than 200,000,000 bu. beyond that required by Brazil and neutral countries and to offset the losses by sinkings. Normal consumption in this country, said to be at the rate of 5.3 bu. per capita, would necessitate the retention of 549,000,000 bu., seed requirements of 87,000,000 bu., and stocks on hand July 1, 1918, of 40,000,000 bu. These estimates lead to the conclusion that the normal consumption must be reduced and that production must be increased in 1918.

The measures adopted for the conservation of wheat and the stimulation of production both in this country and in Europe are outlined with particular reference to winter and spring wheat acreage in the United States; the farm-labor problem; important practices in wheat growing, including selection of

soil, fertilizers, crop rotations, and preparation of the seed; the availability of seed stocks, and approved control measures for the principal insects and diseases attacking the wheat crop.

The value of rye as a substitute for wheat under certain soil and climatic conditions and possible uses of the crop are noted, and increases in rye production in the United States reviewed.

The control of wheat by the Food Administration, and the fixing of wheat prices at primary markets in 1917 and in 1918 are also noted.

Experiments with durum wheat, C. R. BALL and J. A. CLARK (*U. S. Dept. Agr. Bul. 618* (*1918*), *pp. 64, figs. 13*).—The authors discuss the history of durum wheat in the United States, the agronomic adaptation of the crop, statistics of production, the characters and relationships which mark the durum wheats as distinct from the common wheats, and present the results of all the principal variety tests with durum wheat conducted in this country during the period 1895 to 1916, inclusive, together with the results of two experiments made in Canada.

The work comprises an assemblage of the principal accumulated experimental data from 30 field stations, many of which are here published for the first time, while some have appeared previously in publications cited. The investigations have been made cooperatively and independently by this Department and by the State experiment stations. The stations from which the data were obtained are grouped as follows: Subhumid Prairie States, including McPherson and Manhattan, Kans.; Ames, Iowa; Brookings, S. Dak.; Fargo, N. Dak.; Lincoln, Nebr.; Ashland, Wis.; and St. Paul and Crookston, Minn.; the Great Plains or semiarid area, including Hays, Kans.; Highmore, Eureka, and Newell, S. Dak.; Dickinson, Edgeley, Langdon, and Williston, N. Dak.; Moccasin, Mont.; Archer, Wyo.; Amarillo, Tex.; Akron, Colo.; North Platte, Nebr.; Brandon, Man.; and Indian Head, Sask.; and the basin and coast or arid area of the far West, including Nephi, Utah; Aberdeen, Idaho; Burns and Moro, Oreg.; and Modesto and Chico, Cal. The results obtained in the variety tests are presented in tabular form and discussed in detail, and the yields of the durum wheats are compared with those of standard common wheats grown at each station. The detailed presentation of these data are briefly summarized as follows:

For the nine stations in the subhumid prairie area, it is concluded that "in general, the durum wheats are not adapted to the humid conditions often obtaining in the eastern part of this area, but they do comparatively well in the subhumid northwestern part. In the southern part of the prairie area, which includes the eastern portions of Kansas and Nebraska, neither durum nor common spring wheats do well. Wherever the hard red winter wheats of the Crimean group can be grown they greatly outyield any spring wheat. In the northeastern portion of this area, under the conditions obtaining at Ashland, Wis., and St. Paul, Minn., winter wheat is reaching the northern limits of its present culture, and is not so outstandingly superior. The durum wheats are equal in yield to some of the common wheats and poorer than others. The value of the durums will depend on the quality of their grain and the need which exists for their rust resistance. In the northwestern portion of this area, including the western part of Minnesota and the eastern parts of the Dakotas, the durum wheats have a much higher comparative value. They largely outyield the spring common wheats and nearly equal winter wheat in the districts where it can be grown at all. Of the varieties of durum wheat tested Arnautka is best adapted for growing in western Minnesota and the eastern portions of the Dakotas."

The summarized results from 15 stations in the Great Plains area are thought to support the following conclusions: "Durum wheats produce very well in all

but the southern part of this large area. No spring wheats do well in the southern part of the Great Plains. Wherever the hard red winter wheats of the Crimean group can be grown commercially they are better yielders than any spring wheat. In the higher and drier parts of the plains of Colorado and Wyoming and in central South Dakota their advantage is very small. In the central and northern parts of this area, wherever spring wheat is commercially important, durum exceeds spring common wheat in yield almost without exception. Usually this is by a large margin, of 10 to 30 per cent, but occasionally by as little as 5 per cent.

"Of all the varieties of durum wheat tested in this area, the Kubanka is best adapted to all the varying conditions. It is most suitable for central and western North and South Dakota and eastern Montana, at altitudes ranging from 1,800 to 4,000 ft. The Arnautka is slightly better adapted to the more humid eastern part of the Northern Plains with altitudes ranging from 1,000 to 1,800 ft. The Pelissier is a better yielder in the western and drier sections at altitudes of 4,000 to 6,000 ft.

"A number of pure-line selections of durum wheat are proving better adapted to the local conditions where they were developed than are the older standard varieties. Three which differ appreciably from the standard varieties from which they were selected have been named. Five of these races appear to be of sufficient value to be tested under a wide range of conditions. They are as follows: Acme (C. I. No. 5284), a selection from Kubanka (C. I. No. 1516) made at Highmore, S. Dak.; Arnautka (C. I. No. 4064), a selection from Arnautka (C. I. No. 1494) made at Akron, Colo.; Monad (C. I. No. 3320), a selection made from a field in Russia but tested at Dickinson, N. Dak.; Buford (C. I. No. 5295), a selection from Taganrog (C. I. No. 1570) made at Williston, N. Dak.; Kubanka No. 8 (C. I. No. 4063), a selection from Kabanka (C. I. No. 1440) made at Dickinson, N. Dak. Of these five, Acme and Monad are very rust resistant."

A study of the data from the six stations located in the arid basin and coastal areas indicates that "except for the Crimean group of winter wheats, the standard varieties of the western areas differ from those of the Great Plains and Prairie States. In these areas the better yields have been obtained from hard red winter wheats of the Crimean group or from some variety of soft white wheat."

A bibliography of 99 titles is appended.

Cost of harvesting wheat by different methods, A. P. Yerkes and L. M. Church (*U. S. Dept. Agr. Bul. 627* (*1918*), *pp. 22, pls. 2*).—Summarized data are presented and fully discussed regarding the present cost of harvesting wheat in the United States with binders, headers, and combines, and of shocking and stacking wheat, as compared with harvesting by hand, as formerly practiced. The observations are based on a large quantity of statistics relative to operating expenses, including man and horse labor; original cost of the apparatus; repair, interest, and depreciation charges; and the cost of twine. Various other factors entering into consideration are the topography and size of the fields, the area covered by the various pieces of apparatus studied, the character of the soil, the yield of grain and straw, the climatic conditions, etc.

"The cost of harvesting wheat at the present time varies widely in different sections of the country largely because of the different methods employed in these operations. In most cases the particular manner in which the crop is handled is influenced by climatic conditions and the requirements of the cropping system followed, as well as by the character of the wheat itself. The various methods followed throughout the country, therefore, generally are those which have been found to be well adapted to the particular conditions

existing where they are used, although local custom has in some places operated to continue systems that are more expensive than others which would be entirely practicable."

The total estimated cost of cutting one acre of wheat with a binder varied from $0.884 for a binder with an 8-ft. cut to $1.173 for a binder with a 6-ft. cut, each machine being drawn by 4 horses. The possibilities of reducing the cost of harvesting with a binder by the use of a small gasoline engine to operate the binder mechanism are briefly discussed. Twelve and 14 ft. headers with different sizes of crews showed a total cost of $1.06 per acre each for 12-ft. headers with 5 men and 10 horses and for 14-ft. headers with 6 men and 12 horses, as compared with a cost of $1.34 for 12-ft. headers with 6 men and 14 horses, and $1.38 for 14-ft. headers with 8 men and 16 horses. In the case of the combines the maximum cost per acre was $1.88 for the 14-ft. size employing 5 men and 24 horses, decreasing to $1.32 for the 24-ft. size employing 6 men and 36 horses, with a minimum of $1.10 per acre for the 7-ft. size requiring 2 men and 8 horses.

The cost of shocking estimated for various yields ranged from 16 cts. per acre for yields under 20 bu. to 26.5 cts. for yields of 31 bu. or over. The cost per acre of stacking wheat is estimated to be $1.065 for one man pitching and one man loading; 80 cts. for 2 men pitching, with one wagon; and 88 cts. for 2 men pitching, with 2 wagons. Based on present values for man labor, it is estimated that cutting wheat with a cradle and binding and shocking by hand would cost approximately $1.60 per acre, as compared with an average cost of $1.23 for the modern binder, assuming a yield of 16 bu. per acre in each case.

It is concluded that the greater items of expense are for man and horse labor and depreciation of machinery. The large machines showed the smallest cost per acre, while a material saving in harvesting expense is deemed possible by a little inexpensive care of the apparatus, such as better housing, careful overhauling during the winter, etc.

The application of dockage in the marketing of wheat (*U. S. Dept. Agr., Farmers' Bul. 919 (1917), pp. 3–12, fig. 1*).—The object of this publication is to explain clearly to grain farmers and dealers the methods of determining dockage and its relation to the marketing of wheat under the United States Grain Standards Act. The equipment necessary for separating dockage is briefly described, the methods of determining and handling dockage outlined, and the value of dockage indicated. Improper applications of the dockage system are discussed, and the conclusion reached "that the majority of the objections to the assessment of dockage have arisen through misunderstandings as to the proper methods of applying dockage to the grading of wheat."

Shrinkage in grain, F. A. WELTON (*Mo. Bul. Ohio Sta., 3 (1918), No. 2, pp. 39–43*).—This reports the results of shrinkage tests with well-matured and with damp corn, also with oats, wheat, rye, and soy beans, in an effort to determine the exact loss from shrinkage in grain held in storage.

One hundred lbs. of well-matured ear corn was placed in a wooden box on November 1, 1908, and each succeeding year for eight years, and stored in the loft of a corn crib, there being a free circulation of air about the grain at all times. The monthly shrinkage for each of the eight years was determined. The total shrinkage per year ranged from 6.5 to 26.75 per cent, with an average maximum of 20.41 per cent. With one exception (1908–09) the shrinkage increased uniformly, the maximum being attained from July 1 to September 1. Decided variations from the average were thought to be due to unusual climatic conditions during the growing season, especially excessive rainfall.

A duplicate lot of 100 lbs. of corn was kept under the same conditions as noted above, and moisture determinations made on samples of both corn and

cob on the first of each month. The 8-year average results showed that on November 1, immediately after shelling, the grain contained 24.91 per cent moisture and the cobs 41.51 per cent.

Damp corn was likewise stored for five years, analyses showing that on November 1 the shelled corn contained 30.29 per cent moisture and the cobs 50.21 per cent. The maximum shrinkage was attained on August 1, and amounted to 29.2 per cent. In both grades of corn the greater part of the excessive moisture was retained until after March 1, while after August 1 both grades absorbed moisture, showing an average increase of 4.17 per cent from August 1 to the date of maximum increase, which occurred the following February to April. Values of corn, equivalent to $1 per bushel on November 1, have been computed at which the crop must be sold to avoid financial loss through shrinkage in storage. These prices attained maxima on August 1 of $1.26 for well-matured grain and $1.41 for damp grain.

For five consecutive years 40 bu. each of oats and wheat were weighed and stored in a bin for approximately one year, after which the contents of the bin were reweighed. Forty bu. of rye were similarly treated for a 4-year period. Increases in weight were noted in two cases each with oats and rye and in one case with wheat. On the average the oats gained 0.86 per cent moisture, while the wheat and rye lost 2.04 and 3.62 per cent, respectively. Data are presented which indicate that only slight fluctuations of the moisture content of the small grains occurred throughout the year.

Forty bu. of soy beans stored in a small bin November 2, 1911, contained 17.67 per cent moisture, and when weighed at the end of the storage period, October 23, 1912, showed a loss of 3.76 per cent.

Seed Reporter (*U. S. Dept. Agr., Seed Rptr., 1 (1918), No. 5, pp. 8, fig. 1*).—The principal feature of this number is a summary by States of the seed-corn situation based on information from various sources in an effort to show the predominating features. The States included are Illinois, Iowa, Nebraska, Missouri, Kansas, Indiana, Ohio, Minnesota, North and South Dakota, Wisconsin, Michigan, Kentucky, Tennessee, New York, Pennsylvania, Delaware, Virginia, and West Virginia. Tabulated data are presented showing the seed-corn deficiencies and surplus supplies in the first 12 States named above.

Statistical information relative to the stocks on hand and total receipts of red and alsike clover is presented, based on the War Emergency Seed Survey of January 31, 1918, and, in addition, data showing the stocks held for export as found by the Export Clover Inquiry of February 13.

The method of procedure as to approval of export shipments of corn to Canada by the War Trade Board is outlined.

The provision for war-emergency purchases and sales of seeds to farmers by this Department, as autharized by the Food-production Act of August 10, 1917, is described, and its administration in the southwest, northwest, and south plains areas is indicated. Provisions for handling the seed-corn situation are noted from another source on page 834.

Brief comments on tagging shipments of seed corn (E. S. R., 38, p. 441), the vegetable seed situation, profiteering in seeds, and seed-corn prices are presented. Data on the imports of forage plant seed permitted entry into the United States during February are given as usual.

HORTICULTURE.

Report of the horticultural division, J. E. Higgins (*Hawaii Sta. Rpt. 1917, pp. 11–23, pl. 1, fig. 1*).—Work with seedling pineapples (E. S. R., 37, p. 142) was continued during the year. Several thousand potted seedlings are under

observation and are to be brought to fruit under regular field conditions. Selections were made in the fields of several hundred pineapple plants to be propagated by slips or by suckers to determine the constancy of certain characters under asexual propagation. Through the cooperation of the Office of Foreign Seed and Plant Introduction of the U. S. Department of Agriculture two varieties new to the island were introduced, one, the MacGregor, from Queensland, which is said to be immune to the black heart disease; the other variety, the Commonwealth, is a seedling which has given much promise in Australia.

In connection with investigations of fruits suited to tropical conditions a cooperative vineyard of about an acre in extent was established and various fertilizer, variety, and cultural experiments are in progress. The fertilizer experiments thus far conducted indicate that phosphoric acid in liberal amounts must be applied to the type of soil used. It was found that the Japanese beetle (*Adoretus umbrosus*), one of the most important insect pests of grapes in that region, was fairly well controlled by using rather strong doses of arsenical sprays.

The principal work with avocados has been in connection with the development of a winter-ripening type with a rind sufficiently hard and tough for protection from the fruit fly and for profitable shipment. Several different avocados resulting from the crossing of an unnamed promising seedling of Guatemalan type with pollen from four varieties of West Indian avocados are under observation. Seven varieties of avocados attracting much attention in California were introduced into Hawaii during the year.

A number of mango hybrids have been produced in an attempt to combine the several good qualities of the different varieties and are being grown to fruiting. In connection with the papaya breeding investigations, it is noted that the excellence of flavor which characterized one of the original selections has now been transmitted through three generations in a large proportion of the offspring. There is also an encouraging ratio of bearing to nonbearing trees. Breeding work is being conducted with certain varieties of tomatoes in an effort to secure a strain combining sufficient size with resistance to the melon fly, *Dacus cucurbitæ*.

Notes are given on the possibilities of cacao growing in Hawaii, including a discussion of climatic and soil requirements, previous trials of cacao, and methods of cultivation.

[Horticulture at Substation No. 8, Lubbock, Tex., 1909–1914], R. E. Karper (*Texas Sta. Bul. 219 (1917), pp. 36–39, figs. 2*).—A brief summary of variety and adaptation tests conducted with vegetables, fruits, flowers, vines, and shade and ornamental trees.

Massey's garden book for the Southern States, W. F. Massey (*Birmingham, Ala.: The Progressive Farmer Co., 1918, pp. 127, pl. 1, figs. 4*).—The introductory part of this work discusses garden soil and equipment. The succeeding parts give specific information for the culture of all the common vegetables, a monthly working calendar, instructions for growing small fruits and the control of plant diseases and insects, various reference tables, and directions for lawn making.

Home vegetables and small fruits, Frances Duncan (*New York: Charles Scribner's Sons, 1918, pp. XIV+193, pls. 8, figs. 28*).—A popular treatise on the culture and preservation of home vegetables and small fruits.

Dutch market gardening and its organization, H. M. R. Leopold (*Internat. Inst. Agr. [Rome], Internat. Rev. Agr. Econ., 8 (1917), No. 9, pp. 1–6*).—A statistical account of the market garden industry in Holland. A short bibliography of cited literature is included.

The farm vegetable garden, H. O. WERNER (*North Dakota Sta. Circ. 17 (1918), pp. 64, figs. 66*).—A treatise on growing, harvesting, and storing the farm vegetable supply, prepared with special reference to conditions in North Dakota. The winter forcing of plants and the starting and culture of vegetables in hotbeds and cold frames, as well as the outdoor culture of vegetables, are considered. A plan is given of a one-third acre farm vegetable garden operated at the station for three years, together with a graphic representation of dates when various vegetables are seeded, harvested, and stored or forced in order to carry out the station plan.

Disease-resistant varieties of tomatoes, S. N. GREEN and J. G. HUMBERT (*Mo. Bul. Ohio Sta., 3 (1918), No. 2, pp. 43–48, figs. 3*).—This paper summarizes the station work in the selection and improvement of disease-resistant strains of tomatoes.

A number of individual plant selections were made in 1911 and selections from these strains have been grown each season on the trial grounds at Wooster. Another series of selections was begun by the authors in 1915 and the work of testing the selections continued both at Marietta and at Wooster. The results of trials at Marietta in 1917, with special reference to Fusarium resistance, are presented in tabular form.

A strain of the Acme variety procured from the Louisiana Stations gave complete resistance or immunity. This strain, however, gave no greater yield than the nonresistant commercial varieties and was so late in season as to be worthless for early cropping. Two strains of the Beauty variety, the Ohio 76 and the Tennessee Station strain 10–3, gave about the same resistance, 82 and 87 per cent, respectively. The Ohio strain gave the much heavier yield and ripened its crop earlier. Selections are being made of the Bonny Best variety. The work is to be continued until commercially important strains are secured and increased for distribution.

Spray calendar, W. E. BRITTON and G. P. CLINTON (*Connecticut State Sta. Bul. 199 (1918), pp. 51–98, figs. 99*).—A revision of Bulletin 183 of the station (E. S. R., 32, p. 637). The present edition has been enlarged both as to text and illustrations.

Information for fruit growers about insecticides, spraying apparatus, and important insect pests, A. L. QUAINTANCE and E. H. SIEGLER (*U. S. Dept. Agr., Farmers' Bul. 908 (1918), pp. 99, figs. 74*).—This gives directions for the preparation and use of the more important insecticides necessary in combating the various insect pests of orchards, vineyards, etc., as well as other information of use in preventing or reducing insect losses to these crops. Various types of spraying apparatus, nozzles, etc., are described and illustrated, with special reference to their use in orchards and home grounds. A ready reference table for the dilutions of sprays is given, and also a chart showing what sprays may be combined and what plants treated with given sprays.

The paper concludes with a discussion of the more important insects attacking the apple, pear, quince, peach, cherry, plum, grape, currant, and gooseberry, and gives spraying schedules for the treatment of insects and diseases of the apple, peach, and grape.

Dusting v. liquid spraying, W. S. BLAIR (*Agr. Gaz. Canada, 5 (1918), No. 3, pp. 226, 227*).—Tests were conducted by the Experimental Station at Kentville, Nova Scotia, in 1917 to find out the relative efficiency of sulphur dust as compared with the regular lime-sulphur spray in spraying apple trees.

Under the seasonal conditions of 1917 the dust was equally efficient a fungicide as the lime-sulphur and gave better control of cankerworm and other insects. The foliage injury was also less where the dust was used. The estimated cost of dusting one acre of trees was $3.59 more than for spraying one

acre with lime-sulphur, but this increased cost was offset by the great advantage of reduced time in applying the dust.

Dusting v. liquid spraying in Quebec, C. E. Petch (*Agr. Gaz. Canada, 5 (1918), No. 3, pp. 231–233, fig. 1*).—These experiments comparing the value of dusting and liquid spraying as methods of applying insecticides and fungicides were performed in the demonstration orchard of the Quebec Department of Agriculture at Havelock, Quebec.

The results for the one season of 1917 indicate that dusting with sulphur and lead arsenate is fully as efficient in controlling diseases and pests as spraying with lime-sulphur and does not burn the foliage so badly. Although dusting costs more than spraying, the reduced time of application is considered to be a great advantage, especially with the present shortage of labor.

Preparation and use of lime-sulphur, J. A. Stevenson and R. T. Cotton (*Porto Rico Dept. Agr. Sta. Circ. 13 (1918), pp. 9, fig. 1*).—Directions are given for the preparation and use of lime-sulphur with special reference to the spraying of citrus trees.

Cost of producing apples in Yakima Valley, Wash., G. H. Miller and S. M. Thomson (*U. S. Dept. Agr. Bul. 614 (1918), pp. 74, pls. 6, figs. 14*).—This is the fourth of a series of bulletins on the cost of apple production (E. S. R., 36, p. 841). It reports a detailed study in 1915 of the current cost factors involved in the maintenance of orchards and the handling of the crop on 120 representative bearing orchards in Yakima Valley.

The total annual acre cost of producing apples for the 120 farms studied was $345.68, or 80.02 cts. per box, figured on an average yield of 432 boxes per acre The net labor cost was 34.49 cts. per box, or 43.11 per cent of the total net cost. Of the labor cost 17.71 per cent of the total cost was charged to maintenance and 25.4 per cent to handling. Material and fixed costs were 45.53 cts. per box, or 56.89 per cent of the total net cost. The greatest item of fixed cost was the interest on investment, which made up 43.91 per cent of the cost other than labor and 24.98 per cent of the total net annual cost. The increased labor cost in cultivated orchards was offset by lower yields from orchards under the mulch-crop system, hence the total cost of production was essentially the same for both classes of orchards. Only orchards of bearing age, 7 years or older, were considered in this investigation, their average age being 12.6 years.

Of the principal commercial varieties now grown, Winesap, Jonathan, and Ben Davis make up about 43 per cent of the total acreage. Other important varieties grown are Esopus, Missouri, Yellow Newtown, Rome, Beauty, Gano, Arkansas, and Stayman Winesap.

The keeping quality of different varieties of apples, W. T. Macoun (*Ann. Rpt. Pomol. and Fruit Growing Soc. Quebec, 1916, pp. 82–88*).—In this paper the author discusses the keeping quality of various apples under average conditions on the farm and presents the results of tests conducted for a number of years in a small room in the apple cellar at the Central Experimental Farm, Ottawa.

Growing peaches: Sites and cultural methods, H. P. Gould (*U. S. Dept. Agr., Farmers' Bul. 917 (1918), pp. 44, figs. 27*).—This is a revision and combination of the two publications formerly issued as Farmers' Bulletins 631 and 632 (E. S. R., 32, p. 338).

Gooseberries and currants, J. Oskamp (*Indiana Sta. Bul. 207 (1917), pp. 3–11, figs. 10*).—This bulletin contains suggestions relative to the culture, harvesting, and marketing of gooseberries and currants, including directions for the control of insects and diseases and a descriptive list of varieties recommended for Indiana based upon a 5-year test at the station.

Some results in raising new raspberries, C. P. NEWMAN (*Ann. Rpt. Pomol. and Fruit Growing Soc. Quebec, 1916, pp. 114–121*).—A popular account of the author's methods of breeding and raising raspberry seedlings, including some of the results secured.

The direct bearers at the National School of Agriculture, Montpellier, L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 39 (1918), No. 10, pp. 218–224*).—A table is given showing the behavior of a large number of direct-bearing hybrids with reference to the quantity of grapes and number of bunches per plant, relative immunity of foliage and fruit to mildew, period of ripening, and average weight of shoots per plant when grown both on its own roots and stock grafted.

[Report on cultural plats at the Nasinu Experimental Station, Fiji], C. H. KNOWLES (*Fiji Dept. Agr. Ann. Rpt. 1916, pp. 2–8*).—A progress report on cultural experiments with cacao, coffee, rubber, bananas, citrus, and spices.

Fig growing in Florida, H. S. ELLIOTT (*Bien. Rpt. Dept. Agr. Fla., 14 (1915–16), pt. 2, pp. 140–148*).—Popular directions are given for growing figs, with special reference to the production of fresh figs and figs for canning.

A method of feeding manure to orange trees, A. D. SHAMEL (*Cal. Citrogr., 3 (1918), No. 6, pp. 124, 125, figs. 4*).—Observations on the Bahian method of using manure as experimentally tested in California orange groves are given.

The method here described consists essentially in burying the manure in furrows midway between the tree rows. As tested in two groves in California, this method appears to result in better tree growth than with the usual method of broadcasting manures. In one of the tests described, the manure is applied in a furrow midway between the trees running north and south one year and midway between the trees running east and west the next year.

FORESTRY.

Report of Cloquet Forest Experiment Station, W. H. KENETY (*Minnesota Sta. Bul. 169 (1917), pp. 64, figs. 53*).—This bulletin comprises a progress report on the various subprojects conducted at the Cloquet Station since its establishment in 1909. The methods used in the investigational work, including summarized data on some of the projects, are given.

The projects considered include studies in forestation, such as seed production, viability, and methods of extraction, nursery practice, species, methods, and seasons for artificial reforestation, ecological conditions limiting the growth and development of each species, exotics, and species not native to this region but climatically adapted; the effect of different forest stands on the accumulation and melting of snow; cutting systems for securing reproduction; methods of cutting; natural reproduction; thinnings; valuation, based on immature growth, soils suitable for forests, and other considerations; growth and yield of different species; silvicultural studies; and individual tree studies.

Annual progress report on forest administration in the Province of Bihar and Orissa for the year 1916–17, H. H. HAINES (*Ann. Rpt. Forest Admin. Bihar and Orissa, 1916–17, pp. [64]*).—The usual progress report on the constitution and management of the State forests of the Province of Bihar and Orissa, including data relative to alterations in area, forest settlements, forest surveys, working plans, forest protection, silviculture, exploitation, revenues and expenditures, etc.

Progress report on forest administration in the Northwest Frontier Province for the year 1916–17, R. PARNELL (*Rpt. Forest Admin. Northwest Frontier Prov., 1916–17, pp. [23]+XXII*).—A report similar to the above relative to the

administration of the State forests in the Northwest Frontier Province for the year 1916–17.

Progress report of forest administration in the Province of Assam for the year 1916–17, A. W. BLUNT and W. F. L. TOTTENHAM (*Rpt. Forest Admin. Assam., 1916–17, pp. [82], pl. 1*).—A report similar to the above relative to the administration of the State forests of the Western and Eastern Circles in the Province of Assam for the year 1916–17.

Annual administration report of the forest department of the Madras Presidency for the twelve months ended June 30, 1917, H. A. LATHAM, H. B. BRYANT, P. M. LUSHINGTON, and C. D. MCCARTHY (*Ann. Admin. Rpt. Forest Dept. Madras, 1917, pp. 78+LV+13*).—The usual progress report (E. S. R., 37, p. 146) relative to the administration of the State forests in the Northern, Central, Southern, and Western Circles.

Progress report of forest administration in Baluchistan for 1916–17, MULRAJ (*Rpt. Forest Admin. Baluchistan, 1916–17, pp. 11+27*).—The usual progress report (E. S. R., 37, p. 45) relative to the State forests in Baluchistan for the year 1916–17.

A practical reforestation policy, G. A. RETAN (*Jour. Forestry, 16 (1918), No. 3, pp. 335–340*).—In this paper the author examines the silvical and economic status of the State-owned land in Pennsylvania and offers suggestions relative to a practical policy for reforesting these lands.

The indicator significance of native vegetation in the determination of forest sites, C. F. KORSTIAN (*Plant World, 20 (1917), No. 9, pp. 267–287*).—In this paper the author reviews the related literature of the subject and presents tree growth data showing the relative productivity of two distinct western yellow pine sites with differing types of native vegetation.

The rôle of artificial regeneration in the reenforcement of hardwood woodlots, E. SECREST (*Jour. Forestry, 16 (1918), No. 3, pp. 329–334*).—In this paper the author calls attention to certain species which might prove of value in regenerating Ohio woodlots.

The relation of germination in the greenhouse and nursery, S. B. SHOW (*Jour. Forestry, 16 (1918), No. 3, pp. 319–328*).—In this paper the author summarizes the results of cutting, greenhouse, and nursery germination tests with seed of yellow pine, Jeffrey pine, and incense cedar conducted at the Feather River Experiment Station (near Quincy, Cal.) of the U. S. Forest Service.

The work so far done shows that for some species the cutting test gives an excellent index of the germinating power of the seed, while for others it is nearly worthless. With seed of yellow pine and Jeffrey pine from northern California the relations between germination in the greenhouse and the nursery to cutting-test values are remarkably consistent for all lots and for all years. The first-year greenhouse tests, running for a period of 100 days, averaged but 75 per cent of the cutting test. The corresponding nursery tests exceeded the greenhouse tests slightly and were 76 per cent of the cutting test, or just normal. There is a much wider range of variation in seed from southern California than for northern seed, and other considerations aside, the use of southern seed is undesirable because of its inconsistent behavior.

The behavior of incense cedar is extremely variable. The new seed with equal greenhouse and nursery germination averaging 40 per cent of cutting test values was the most reliable. Generally speaking, yellow and Jeffrey pines display reasonably consistent average values for number of seed per pound, relation of germination to the cutting test, and rapidity of germination, whereas such species as sugar pine, incense cedar, and firs show such great variability that average figures probably will apply only about half the time.

Aspen as a temporary forest type, F. S. BAKER (*Jour. Forestry, 16 (1918), No. 3, pp. 294–303, figs. 3*).—In this paper the author sums up the evidence showing the temporary nature of aspen in contrast to the paper by Fetherolf (E. S. R., 37, p. 837), in which aspen is considered as a permanent forest type.

Accelerated growth of balsam fir in the Adirondacks, E. F. McCARTHY (*Jour. Forestry, 16 (1918), No. 3, pp. 304–307, fig. 1*).—The data here presented are based upon measurements made following a pulp logging operation near Brandeth Lake, N. Y. The author concludes that a crop of balsam fir, merchantable as pulp logs, can be produced in 60 years from seedlings, and that thinning will not be necessary during this period of production.

The planting of Scotch pine in Pennsylvania, J. S. ILLICK (*Forest Leaves, 16 (1917), No. 6, pp. 87–90, pls. 4*).—A discussion of the peculiarities and demands of Scotch pine (*Pinus sylvestris*), based on observations of plantings made for several years in the State forests of Pennsylvania and on the European literature of the subject.

Studies of yield and reproduction of western yellow pine in Arizona and New Mexico, G. A. PEARSON (*Jour. Forestry, 16 (1918), No. 3, pp. 273–293*).—A progress report on yield and reproduction studies which were started in 1909 and are to be continued for several years.

The data given comprise a five-year record of four "extensive" plats aggregating 1,138 acres in area. They show the increase in number of trees, condition of stands, number of dead trees and cause of death, increment, and reproduction. Factors influencing these data are also discussed. In view of the short period of observation data secured on "intensive" plats which deal with individual trees are for the most part omitted from this article.

First season's growth and mortality of white pine and red pine plantations, C. H. GUISE (*Jour. Forestry, 16 (1918), No. 3, pp. 308–318, figs. 2*).—The study reported in this paper was conducted largely on an experimental area of the department of forestry at Cornell University to determine the relative rates of height growth and root development and the mortality during the first season of planting with various grades of red pine and white pine nursery stock. The data given are for the one season, 1915.

All grades of stock commenced and ceased height growth during the same period. The better the grade of stock planted, the more satisfactory were the results as to growth and absence of mortality.

Memorandum recommending clean clearing of rubber estates in Malaya, A. SHARPLES and W. N. C. BELGRAVE (*Agr. Bul. Fed. Malay States, 6 (1917), No. 2, pp. 88–91*).—The authors present a general scheme for the treatment of pests and diseases which attack the roots of rubber trees. The recommendations herein embodied are the result of work carried out in the mycological laboratory of the Federated Malay States Department of Agriculture during 1915–16.

The production and use of fuel wood, E. SECREST (*Mo. Bul. Ohio Sta., 3 (1918), No. 2, pp. 49–54, figs. 2*).—This paper contains information relative to the equipment and cost of producing fuel wood, together with hints on using wood for fuel and suggestions relative to woodlot improvement.

Measuring woodland products, J. B. BERRY (*Ga. State Col. Agr. Bul. 142 (1918), pp. 16, figs. 9*).—Methods of measuring and calculating the contents of standing timber and of wood lot products are illustrated and described.

The distribution of softwood lumber in the Middle West, Pts. I, II.—Studies of the lumber industry, VIII–IX, O. M. BUTLER (*U. S. Dept. Agr. Rpts. 115 (1917), pp. 96, pls. 2, figs. 25; 116 (1918), pp. 100, figs. 25*).—A study of lumber wholesaling and retailing in eleven of the Central States, including

data on costs and returns, retail and wholesale prices, lumber freights, and the division of the retail price of lumber among the various agencies concerned in its manufacture and distribution. Report 115 deals with wholesale distribution and Report 116 deals with retail distribution. The study was conducted during 1914 and 1915 in connection with the general study of conditions in the lumber industry in the United States (E. S. R., 36, p. 644; 38, p. 248).

DISEASES OF PLANTS.

Report of the division of plant pathology, C. W. CARPENTER (*Hawaii Sta. Rpt. 1917, pp. 33–42, pls. 2*).—An outline is given of work carried on by the station during the year covered by the report, the principal investigations having been on the diseases of the Irish potato and the banana.

Considerable trouble is reported with the Fusarium wilt disease of Irish potatoes and the late blight due to *Phytophthora infestans*. Spraying experiments for the control of late blight were conducted on a large scale, an increase of 57 per cent in yield of tubers being secured from plants given three applications of 5:5:50 Bordeaux mixture. The wilt disease due to *F. oxysporum* has been repeatedly observed, and the author suggests hill selection of seed, the discarding of such tubers as show brown discoloration at the cut stem end, and planting in new soil as the best available means of control. The mite disease of potatoes is briefly described, the trouble having been observed early in May and June. It seems very prevalent and destructive in hot weather, and is characterized by the withering and drying of the new terminal growth and that in the leaf axils. Examination of infected material has shown the constant presence of mites, but whether they are entirely responsible for the trouble or only associated with it remains to be determined.

The author reports the occurrence in Hawaii of a disease of bananas closely resembling that described by Drost (E. S. R., 27, p. 50) as due to a species of Fusarium. This is said to be identical with the disease described by Fawcett (E. S. R., 36, p. 352) as occurring in Porto Rico. Among other diseases of bananas, a brief description is given of the rotting before they unroll of the central leaves of the Chinese variety and the occurrence of minute gray spots which later turn black on the fruits of the same variety. The spots are said to increase in size more or less and to disfigure the fruit, rendering it unsightly and unfit for export. A Glœosporium-like fungus seems to be associated with this trouble.

A number of diseases on vegetables and fruits are listed.

Plant diseases, F. C. STEWART and M. F. BARRUS (*N. Y. Dept. Agr. Bul. 86 (1916), pp. 2426–2431*).—Brief notes are given on apple scab, peach leaf curl, pear blight, oat smut, stinking smut of wheat, tomato blight, bean anthracrose, and potato diseases, and on the use of powdered sulphur.

Notes on South Indian fungi, W. MCRAE (*Madras Agr. Dept. Yearbook, 1917, pp. 108–111*).—A spike disease of paddy noted in the wet lands near Coimbatore and said to be caused by *Ephelis oryzæ* is briefly described. In Karamadai, Coimbatore, and Pollachi, in Coimbatore District, and in Koilpatti in Tinnevelly District, *Andropogon sorghum* is attacked by a fungus which changes the starch of the developing grain to sugar. In the absence of a perfect stage the fungus is called *Sphacelia sorghi*. *Hapalophragmium ponderosum* is noted as having produced galls on *Acacia leucophylla* in Nellore, Chittoor, Salem, and Coimbatore districts. *Melampsora lini* has been found on the leaves of *Linum usitatissimum*, *Melampsorella ricini* on leaves of *Ricinus communis*, and *Puccinia spongiosa* on *Webera corymbosa*, all in Coimbatore. *Rhizoctonia destruens* is reported on potatoes near Balliguda Agency, Ganjām

District, and on *Sesbania grandiflora* at Nellikuppan, South Arcot, and *R. violacea* on *Medicago saliva* in the Salem District. On the Nilgiri Hills, *Phyllactinia corylea* (conidial stage only) was found on leaves of *Morus alba*, *Oïdium citri* on *Citrus aurantium*, and *Pestalozzia funerea* on *Eucalyptus globulus*. *Vermicularia curcumæ* was found on *Curcuma longa* in the districts of Kistna, Coimbatore, and Kurnooi. *Collybia albuminosa*, an edible mushroom, appears each year during and after the northeast monsoon, growing from the "comb" of an Odontotermes.

Diseases of woody plants in North Africa, R. MAIRE (*Bul. Sta. Forest. Nord Afrique, 1 (1917), No. 5, pp. 183–186, fig. 1*).—Study of a leaf spot and deformation of *Rhus oxyacantha* showed the presence of a fungus which is discussed and technically described as a new species of Exobasidium under the name *E. hesperidum*.

Rhizopus maydis, a new species, J. BRUDERLEIN (*Bul. Soc. Bot. Genève, 2. ser., 9 (1917), No. 1–3, pp. 108–112*).—A fungus found in corn meal is considered a new species and is technically described as *R. maydis*.

Grain smut, G. LO PRIORE (*Staz. Sper. Agr. Ital., 49 (1916), No. 7–8, pp. 425–435*).—Referring to earlier studies by himself (E. S. R., 7, pp. 224, 787) and by others, the author gives an account of his more recent investigations on *Cladosporium herbarum* as to its effects on different varieties of wheat. These effects are discussed as to the alterations produced by the fungus.

Results of corn disease investigations, G. N. HOFFER and J. R. HOLBERT (*Science, n. ser., 47 (1918), No. 1210, pp. 246, 247*).—A preliminary report is given of a three years' study of some little understood diseases of corn, the investigations having been made with dent corn in ear-to-row tests.

The authors have found that barren stalks and stalks which bear only nubbins appear to be correlated with certain pathological conditions in the plants. In test rows grown from ears which exhibited this pathological condition in the seedlings, 15.2 per cent were barren stalks, and 6.2 per cent of the stalks bore nubbins only, as contrasted with 6.3 per cent barren stalks and 3.4 per cent nubbin-bearing stalks where no such condition was shown.

These investigations indicate that surface-sterilized seeds may harbor bacteria and species of Fusarium. This is particularly true of the bacteria which cause a rotting of the seedling root tips, and this rotting is said to be characteristic of the ears of corn which develop the greatest number of barren and down stalks in the field. Controlling by hand pollination the fertilization of apparently disease-free stalks greatly reduced the number of barren stalks.

Tests made of seed in the germinator are said to have shown that all kernels from the same infested ear do not harbor pathogenic organisms, nor can the rate of seedling development usually referred to as vitality be taken as a criterion for assuming freedom from bacteria and species of Fusarium. The rate of seedling development in the germinator is claimed to be not indicative of the yield possibilities of that seed ear.

Greenhouse experiments on the rust resistance of oat varieties, J. H. PARKER (*U. S. Dept. Agr. Bul. 629 (1918), pp. 16, pls. 3, figs. 2*).—This paper presents results obtained in greenhouse culture work at Cornell University with the stem rust (*Puccinia graminis avenæ*) and the crown or leaf rust of oats (*P. lolii avenæ*).

Inoculations made on more than 120 strains showed 80 of these to be entirely susceptible to the rusts at both the seedling and the heading stages. Unquestionable resistance to stem rust appeared in only two varieties, White Tartarian and Ruakura Rustproof, though several varieties of red oats (*Avena sterilis*), including certain strains of Burt, Cook, Appler, Italian Rustproof, Red Rustproof, and Turkish Rustproof, are very resistant to crown rust. Resistance

to each of these rusts is claimed to be somewhat strictly specific. The evidences of resistance as described for wheat also apply to oat varieties. Early production of telia on seedling leaves probably indicates resistance.

Further search must be made for varieties resistant to stem rust, as no variety of the *A. sterilis* group has yet been found which will withstand its attacks. A basis is now offered for making selections and crosses to produce improved oat varieties resistant to crown rust and suited to conditions in different oat-growing portions of the United States.

Tylenchus tritici on wheat in Virginia, F. D. FROMME (*Phytopathology, 7* (*1917*), *No. 6, pp. 452, 453, fig. 1*).—The author reports having received specimens of wheat attacked by *T. tritici* from a correspondent in Virginia. The presence of this nematode in wheat is said to have been noted for about six years, and the loss in a field of 10 acres due to its presence in 1917 is estimated as about 25 per cent.

Sclerotinia trifoliorum, the cause of stem rot of clovers and alfalfa, A. H. GILBERT and C. W. BENNETT (*Phytopathology, 7* (*1917*), *No. 6, pp. 432–442, figs. 5*).—An account is given of investigations of *S. trifoliorum*, which is said to attack alfalfa, crimson clover, red clover, and white clover and to have been observed on one occasion on *Euphorbia maculata*. This fungus has long been known to attack red clover in Europe, but was first reported in this country on red and crimson clover in 1890 (E. S. R., 3, p. 689). The authors describe the disease and life history of the causal organism and give observations on its morphology, parasitism, saprophytism, etc.

The disease causes a wilting of the leaves and stems and a rotting of the stems and root systems, accompanied by the formation of black sclerotia. Greenhouse experiments resulted in the production of the disease on young clover and alfalfa plants from pure cultures of the fungus.

Suggestions are given for the control of this disease, deep plowing, scattering lime over the soil, and rotation of crops being considered effective methods.

Cabbage diseases, L. L. HARTER and L. R. JONES (*U. S. Dept. Agr., Farmers' Bul. 925* (*1918*), *pp. 30, figs. 14*).—This is a revision and extension of Farmers' Bulletin 488 (E. S. R., 27, p. 249).

Short smut on cholam, S. SUNDARARAMAN (*Madras Agr. Dept. Yearbook, 1917, pp. 99–107*).—The fungus (*Cintractia sorghi-vulgaris*) causing the so-called short smut on cholam (*Andropogon sorghum*) is briefly described. This is said to be the second crop, as regards acreage and importance, in the Madras Presidency, and the loss caused by the smut is very considerable.

The study here reported was intended to determine the location of infection of the host plant, the minimum effective concentration of copper sulphate solution, the effect of this concentration on germinability, and the efficiency of a copper sulphate solution of definite concentration in preventing infection in a crop. Steeping seeds in copper sulphate solution of 0.5 to 1 per cent concentration did not reduce germinability, but such reduction did follow the use of 16 per cent strength. The duration of the treatment did not markedly affect the germinability of the seeds. Strengths of 0.5 per cent and upward completely prevented the development of smut spores, untreated spores germinating freely in 24 hours. Stirring appears to be essential to complete prevention of the disease. Field tests gave similar results, and it was decided to recommend a 2 per cent solution and a 15-minute period as safe and convenient. Formalin is not considered as suitable for general use.

A Sclerotinia parasitic on Matthiola vallesiaca, A. LENDNER (*Bul. Soc. Bot. Genève, 2. ser., 9* (*1917*), *No. 1–3, pp. 21–29, figs. 3*).—The author notes the presence of the fungus described as *S. matthiolæ* n. sp. on several crucifers,

but more particularly injurious to *M. vallesiaca*. The fungus is considered to be closely related to *S. panacis* and *S. libertiana*.

Wilt diseases of okra and the Verticillium wilt problem, C. W. CARPENTER (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 9, pp. 529–546, pls. 12*).—The author states that there are two wilt diseases of okra, caused, respectively, by *Fusarium vasinfectum* and *V. alboatrum*, which are so similar that they can be differentiated only by isolating the causal fungi. The Fusarium wilt is more serious in the southern portion of the okra-growing district, while the Verticillium wilt is more serious in the northern portion, although the former has been found in Connecticut and the latter in South Carolina and Alabama. It is claimed that cotton may be attacked by both these fungi. *V. alboatrum* was isolated also from the discolored vascular system of wilting plants of eggplant, potato, Abutilon, and Xanthium, causing a wilt disease in at least the first two of these. It is also known to cause a wilt disease of snapdragon. Both the fungi are readily cultivated artificially, suggesting the persistence of both in a saprophytic condition in the soil. Control measures suggested include selection of seed from healthy plants only; disinfection in formalin solution, 1:240, for two hours; and avoidance in planning rotations of all plants known to be susceptible to these fungi.

Further evidence relative to the varietal resistance of peanuts to Sclerotium rolfsii, J. A. MCCLINTOCK (*Science, n. ser., 47 (1918), No. 1203, pp. 72, 73*).—In continuation of a previous report (E. S. R., 37, p. 49), the author presents additional data regarding the resistance of the variety Virginia Runner to attacks of *S. rolfsii*.

Sugar-cane fungi and diseases of Porto Rico, J. R. JOHNSTON and J. A. STEVENSON (*Jour. Dept. Agr. P. R., 1 (1917), No. 4, pp. 177–264, pls. 13*).—In this report, which is intended to be a complete discussion of the sugar-cane fungi of Porto Rico so far as yet studied and definitely determined, technical descriptions are given of some fungus forms with some popular descriptions of diseases and causal organisms.

It is stated that sugar-cane diseases have been present and serious since 1870, and that some now present several difficult problems. Fungi found chiefly on the roots or lower stalk include *Marasmius sacchari*, *Himantia stellifera*, and *Odontia saccharicola*, all of these being more or less concerned in the so-called root disease. The principal stalk diseases include red rot (*Colletotrichum falcatum*), rind disease (*Melanconium sacchari*), and a new disease (*Cytospora sacchari*) which seriously threatens certain varieties. A number of leaf diseases are of universal occurrence, though none appear to be seriously injurious. Descriptions are given of red spot of the leaf sheath (*Cercospora vaginæ*), red rot of the leaf sheath (*Sclerotium rolfsii*), eye spot (*Helminthosporium sacchari*), ring spot (*Leptosphæria sacchari*), brown leaf spot (*Cercospora longipes*), red stripe, and wither tip. The only important disease of cane cuttings, which is that due to *Thielaviopsis paradoxa*, is readily prevented by dipping the seed in Bordeaux mixture.

A chlorotic disease occurring on the south coast is described in connection with control measures. Yellow stripe occurs in very limited areas. The new disease (as yet uncontrolled), which is characterized by a mottling of the leaves followed by a stalk canker, occurs in the western portion of the island occasioning heavy losses. Injuries due to such agencies as lightning, winds, floods, and drought are also discussed. Certain abnormalities mentioned are regarded as of little importance.

A bibliography is appended.

An epiphytotic of cane disease in Porto Rico, J. A. Stevenson (*Phytopathology, 7 (1917), No. 6, pp. 418–425, figs. 2*).—An account is given of a disease of sugar cane which has been noted elsewhere (E. S. R., 38, p. 150).

Tobacco wildfire, F. A. Wolf and A. C. Foster (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 7, pp. 449–458, pls. 2, figs. 2*).—In this contribution from the North Carolina Experiment Station, the leaf spot of tobacco which has been named wildfire (E. S. R., 38, p. 150) is said to exist in 19 counties of North Carolina and in 3 of Virginia, and also to occur in Wisconsin. It is claimed to be the most destructive disease of tobacco. While the disease originated in the seed bed or plant bed, only negative evidence has been obtained to show that infection occurs through the seed. The organism (*Bacterium tabacum*), which has an incubation period of about 72 hours, forms large spots within one week on the leaves, to the parenchymal portions of which it is confined. Moisture, especially when accompanied by wind, is of prime importance in the rapid spread of the disease.

Brown rot of fruit.—Investigations in Hawke's Bay, G. Esam (*Jour. Agr. [New Zeal.], 15 (1917), No. 2, pp. 84–89*).—Brown rot, considered the most destructive of the many pests and diseases attacking fruits and fruit trees in New Zealand, is briefly discussed as causing severe injury in Hawke's Bay and Auckland. A brief account is given of the life history of the disease, and also of investigations. Inoculation tests are described which seem to indicate that the organism is a wound parasite.

Root knot of fruit trees, J. A. Campbell (*Jour. Agr. [New Zeal.], 15 (1917), No. 2, pp. 63–68, figs. 5*).—Root knot and associated or similar abnormalities due to *Bacterium tumefaciens*, after being almost totally suppressed in New Zealand following Government and other action, appeared again in 1915. In 1916 a serious situation became evident, this leading to investigations under the direction of the minister of agriculture.

The resulting report states that root knot and hairy root are due to the same organism. Trees from affected nurseries appearing clean when planted may develop galls after 12 months. Root knot is said to be highly detrimental to peach and raspberry, and possibly detrimental also to apple or pear.

Field experiments with crown gall, 1913–1917, H. Ness (*Texas Sta. Bul. 211 (1917), pp. 3–21, figs. 7*).—The rapid spreading of crown gall in Texas orchards is thought to have had its beginning in the extensive planting of commercial-peach orchards some 25 or 30 years ago. The climate of the Southern States is thought to be favorable to this disease, owing to its humidity and comparative freedom from frost. Absence of noticeable galls is no reliable indication of freedom from infection by the gall organism (*Bacterium tumefaciens*). Infection may occur through very slight contacts.

Tests were made with several fungicides of different strengths, and it appears that copper sulphate will prevent the occurrence of crown gall on nursery stock, if it is properly used. For sound peach trees 7 oz., and for apple trees about 1 lb., to 26 gal. of water, with an exposure of two hours in either case, are recommended. Preparation for this treatment includes the cleaning and pruning of the roots and branches and careful examining of the roots. The collar should be several inches below the surface of the disinfecting solution. The tops also should be carefully wetted with the copper solution.

Black spot of apples [and pears], W. H. Taylor (*Jour. Agr. [New Zeal.], 15 (1917), No. 2, pp. 98–100*).—*Venturia inæqualis* (*Fusicladium dendriticum*) and *V. pyrina* are discussed in connection with their effects on apple and pear, respectively, and their treatments, the latter being very similar for both species and preferably preventive.

A fungoid disease attacking pears, I. W. HELMSING (*Jour. Agr.* [*New Zeal.*], *15* (*1917*), *No. 2, pp. 96, 97, figs. 4*).—*Entomosporium maculatum*, causing a disease resembling pear scab (*Venturia pyrina*), is briefly described as attacking readily the fruits of several varieties of pear and sometimes the young trees in the nursery, causing defoliation with a severe drain on their vitality. Peach, quince, and other orchard trees are also attacked by this fungus.

Black knot of plum and cherry, R. C. WALTON (*Mo. Bul. Ohio Sta.*, *3* (*1918*), *No. 2, pp. 36–38, figs. 2*).—A popular description is given of the characteristics of the black knot of plum and cherry due to the fungus *Plowrightia morbosa*, with recommendations as to control measures.

The anthracnose disease of the raspberry and related plants, W. H. BURKHOLDER (*New York Cornell Sta. Bul. 395* (*1917*), *pp. 155–183, figs. 10*).—A marked decrease in raspberry acreage and yield occurring within the last ten years is attributed principally to several diseases, of which anthracnose is regarded as the most serious. Varietal susceptibility is not prominent within this species. The red raspberries (*Rubus idæus* and *R. idæus aculeatissimus*) are not very susceptible but the black raspberry (*R. occidentalis*) is very markedly so. The disease has been shown previously to be caused by *Plectodiscella veneta*, the perfect form of *Glœosporium venetum* (E. S. R., 33, p. 350; 38, p. 252). An account is given of the life history and the geographic distribution of the fungus, the symptoms on various portions of the host, its morphology and nomenclature, its pathological histology, its cultural characters, inoculation experiments, effects of weather conditions, and control, which is aided greatly by careful selection. A review of spraying experiments is not uniformly encouraging.

Ammonium sulphid wash for American gooseberry mildew, J. V. EYRE and E. S. SALMON (*Jour. Bd. Agr.* [*London*], *23* (*1917*), *No. 11, pp. 1098–1100*).—This note states that an extensive series of experiments, carried out under glass and in the open air during 1916, has again demonstrated the value of ammonium sulphid as a fungicide as against powdery mildews (Erysiphaceæ) in general, and in particular the American gooseberry mildew, the results completely corroborating the conclusions from a study previously reported (E. S. R., 35, p. 654). The present communication emphasizes the absolute necessity of including 0.5 per cent soft soap (5 lbs. to 100 gal.) in order to secure thorough wetting of the surface. Directions are given for making up an effective form of this preparation.

The supposed injury to vines by sulphurous anhydrid, A. TROTTER (*Riv. Patol. Veg.*, *9* (*1917*), *No. 1–2, pp. 1–24*).—A discussion is given of the data and views of several investigators regarding the alleged injury to grapevines by sulphur compounds.

Anthracnose or black spot of the vine, F. DE CASTELLA and C. C. BRITTLEBANK (*Jour. Dept. Agr. Victoria*, *15* (*1917*), *No. 7, pp. 404–421, figs. 16*).—It is stated that after being almost completely absent from vineyards in Victoria for almost 20 years, black spot has reappeared, showing in some localities unusual virulence. A discussion is given of the disease and of preventive measures.

New disease of the pineapple reported, D. B. MACKIE (*Philippine Agr. Rev.* [*English Ed.*], *10* (*1917*), *No. 2, p. 150, pl. 1*).—Mention is made of a disease affecting two varieties of pineapple in the Philippine archipelago. It is characterized by tissue hypertrophy, causing a rough appearance of the fruit. A heart rot of the suckers may be due to the same trouble. The disease is thought to be identical with the one which has proved troublesome in the Hawaiian Islands.

The crown canker disease of rose, L. M. Massey (*Phytopathology, 7 (1917), No. 6, pp. 408–417, figs. 3*).—The author reports having his attention called in September, 1916, to a hitherto unreported disease of roses grown near Philadelphia. Subsequently, plants affected with the crown canker disease were received from growers in Missouri, Pennsylvania, Indiana, Michigan, Massachusetts, and New York. Both grafted plants and those growing on their own roots are said to be affected, and it is considered questionable whether any variety is immune. From the investigation thus far carried on, the author believes that this may prove to be one of the most important diseases of roses grown under glass. So far no record of the disease on plants grown out-of-doors has been made.

Plants are affected at the crown, usually just at the surface of the soil, the lesion in advanced cases frequently extending several inches above the soil. The first indication of the disease is a slight discoloration of the bark, the color rapidly deepening to black and the tissues appearing water-soaked. Soon cracks appear in the bark, extending into the wood. Later a swelling of the stem occurs at and above the affected areas and the cracks become deeper and more evident. One very noticeable characteristic of the disease is said to be the punky consistency of the diseased tissue, especially that underground. Suckers developing from the roots of diseased plants are usually spindling and yellow and are commonly affected at the point of attachment to the main stem. Affected plants do not die quickly but yield increasingly poorer and fewer blossoms.

The crown canker disease is said to be caused by the fungus *Cylindrocladium scoparium*, and a detailed account is given of its pathogenicity, cultural characters, and moisture relations.

Experiments are said to be under way in the hope of developing some method of control for the crown canker of the rose, but at present soil sterilization and the exercise of care in using only healthy stock and scions seem to be the only feasible methods of controlling the disease.

Cronartium cerebrum on Pinus resinosa, J. R. Weir and E. E. Hubert (*Phytopathology, 7 (1917), No. 6, pp. 450, 451*).—The Norway pine (*P. resinosa*) is usually considered free from attacks of tree rusts, but the authors report infection by *C. cerebrum* on a young Norway pine tree which stood in a dense stand of *P. banksiana* heavily infected with the rust.

The significance of diseases in the economy of Malayan rubber plantations, A. Sharples (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 6 (1917), pp. 225–229*).—A review is given of researches on fungus diseases of *Hevea brasiliensis* in Malaya. Two instances of serious attack by root diseases are cited as showing the necessity for active measures in sanitation. A practice which has been effective in the past in combating diseases was to grow more trees than are absolutely necessary in order to provide a compensatory growth to offset the ravages of root disease. Conditions for the spread of fungus diseases are said to be more favorable at the present time in Malaya than in any other rubber growing region, so that this practice is now ineffective and the menace from disease is becoming serious. The two main requirements of the present time are a physiological investigation regarding the rôle of the latex in the metabolic processes of the plant and the extent of the interference of latex extraction with the development of the tree.

Bark canker in Hevea brasiliensis, A. Sharples (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 6 (1917), pp. 219–225*).—The author has collected observations on Hevea bark canker which have been made in various rubber growing regions. These are considered to show that the present situation is most un-

satisfactory and that the subject still requires further patient investigation before the disease can be successfully combated.

Spike disease of sandal, L. C. COLEMAN (*Dept. Agr. Mysore, Mycol. Ser. Bul. 3* (*1917*), *pp. IV+52, pls. 19, figs. 3*).—A study of the so-called spike disease of sandal continued for several years is described in considerable detail in a report which is considered as clearing the way for further studies of this trouble, which is said to cause large and increasing losses over a considerable portion of southern India.

While the disease was not referred to any unfavorable condition in soil, climate, or association as regards its causation, it is thought that unfavorable conditions increase its virulence and transmissibility. The trouble shows itself in a profound disturbance of the ordinary functions, leading to a continuous growth of leaves and twigs, a characteristic reduction in the size of the latter, an accumulation of starch in the leaves and branches, and death of the haustoria and root ends. It is communicable by grafting, and supposedly due to an ultramicroscopical organism. Similar and similarly infectious diseases have been noted on other trees in areas where sandal grows. It is claimed that the disease may be spread by means of root connections, birds, or insects.

The effect of Roentgen and ultraviolet rays upon fungi, H. L. TRUMBULL and J. W. HOTSON (*Phytopathology, 7* (*1917*), *No. 6, pp. 426–431, figs. 2*).—It is stated that the museum of the University of Washington, Seattle, which served as a forestry building during the exposition conducted in 1909, was built of logs of green Douglas fir and western hemlock. These logs are said to be showing signs of decay resulting from an attack of *Fomes pinicola*. Experiments have been conducted to combat the ravages of the fungus, principally by impregnation of the wood with copper and other salts, but to avoid the difficulties of such treatment experiments were also conducted with Roentgen and ultraviolet rays to determine the possibility of destroying the fungi. Exposures were made to both kinds of rays for varying periods of time.

The results obtained do not indicate that the method employed would prove suitable for the control of such wood-destroying fungi as *F. pinicola*.

Some problems connected with the treatment of fungus diseases by spraying, E. S. SALMON and J. V. EYRE (*Rpt. Brit. Assoc. Adv. Sci., 86* (*1916*), *pp. 488, 489*).—This is mainly a discussion of the different avenues of approach ordinarily open to the solution of the various problems that arise in connection with economic diseases of plants, namely the fungus itself, the host, and the nature of the fungicide. Another aspect of the problem is the effect of a substance to increase the fungicidal properties of another substance, as in the case of paraffin in a spray fluid containing soluble sulphid, or of soap in liver of sulphur. Still another aspect is the question of securing intimate contact of the spray with the fungus by the addition of ingredients to lower the surface tension of the spray fluid and the measurement of such lowering.

The conduction of potassium cyanid in plants, J. A. ELLIOTT (*Phytopathology, 7* (*1917*), *No. 6, pp. 443–448, figs. 2*).—A report is given of experiments conducted by the author with herbaceous and woody plants to determine the path of conduction of potassium cyanid through the plants and the extent of local and general injury.

It was found that potassium cyanid is conducted in the vessels and diffuses from them into the surrounding tissues, the diffusion being greatest when the conduction is slowest. Injury to the plants is said to be local, corresponding to the distribution of the potassium cyanid, except where the local injury has a secondary injurious effect on other parts of the plants. Actively growing tissues are most readily killed. In woody plants, injury is dependent on the

amount of cambium reached by the cyanid and the extent to which other parts of the plant are dependent on the injured cambium.

The wide differences in results of treatment of plants with potassium cyanid are believed to be due to slightly different manners of treatment in the different cases. Less injury is to be expected when trees are treated in the dormant state.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Food habits of the swallows, a family of valuable native birds, F. E. L. Beal (*U. S. Dept. Agr. Bul. 619 (1918), pp. 28, pls. 2*).—This is a report of a technical study of the food habits of 7 of the 13 species of swallows occurring within the limits of the United States, namely, the purple martin (*Progne subis*); cliff, or eaves, swallow (*Petrochelidon lunifrons*); barn swallow (*Hirundo erythrogastra*); tree, or white-bellied, swallow (*Iridoprocne bicolor*); violet-green swallow (*Tachycineta thalassina*); bank swallow (*Riparia riparia*); and rough-winged swallow (*Stelgidopteryx serripennis*). All the species are more or less gregarious and these 7 are of such wide distribution as to render their food habits a subject of economic interest.

Lists are given of the insects identified in the stomachs of the 7 species, together with the following table showing the relative proportions of the most important elements of food of the species:

Relative proportions of the most important elements of the food of swallows.

Food items.	Purple martin.	Cliff swallow.	Barn swallow.	Tree swallow.	Violet-green swallow.	Bank swallow.	Rough-winged swallow.	Average for the 7 species of swallows.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Weevils	2.63	8.38	1.96	1.92	4.12	5.78	4.93	4.25
Other beetles	9.90	18.50	13.66	12.50	6.45	12.12	9.90	11.86
Ants	3.52	8.24	9.89	6.37	9.42	13.39	11.99	8.97
Other Hymenoptera	19.47	20.51	12.82	7.58	17.48	20.10	18.91	16.70
Hemiptera	14.58	26.32	15.10	5.59	35.96	7.96	14.90	17.20
Diptera	16.09	13.25	39.49	40.54	19.36	26.63	32.89	26.89
Lepidoptera	9.39	.46	2.39	1.07	3.12	1.21	1.11	2.68
Orthoptera	1.09	.71	.51	.38	....	.01	.12	.40
Other insects	22.87	2.56	3.72	4.25	4.09	12.64	4.48	7.80
Other animal food	.46	.41	.28	.34	....	.14	.56	.31
Vegetable food	....	.66	.18	19.46	....	.02	.21	2.93

The crow and its relation to man, E. R. Kalmbach (*U. S. Dept. Agr. Bul. 621 (1918), pp. 92, pls. 2, figs. 3*).—This new treatise on the economic status of the crow (E. S. R., 7, p. 840) discusses in detail the beneficial and harmful food habits of the crow, gives a general account of its life history and geographic distribution, and shows how it may be controlled where necessary. It is pointed out that while the misdeeds with which the crow has been convicted greatly outnumber its virtues these are not necessarily equal in importance. Much of its damage to crops and poultry can be prevented while its services in the control of insect pests can ill be spared. As the capabilities of the crow for both good and harm are great, it is believed that an extermination of the species would have ultimate consequences no less serious than an overabundance.

A list of the insects and other animals and plants specifically or generically identified in the stomachs of 2,118 crows examined is included.

Diagnosis of a new pycnonotine family of Passeriformes, H. C. Oberholser (*Jour. Wash. Acad. Sci., 7 (1917), No. 17, pp. 537–541*).

British birds, A. THORBURN (*London: Longmans, Green & Co., 1916, 2. ed., vols. 1, pp. VIII+143, pls. 20; 2, pp. VI+72, pls. 20; 3, pp. VI+87, pls. 20; 4, pp. VII+107, pls. 20*).—This work contains sketches in color from life of more than 400 species of British birds, including not only resident species but also those which more or less regularly or even rarely visit the British Isles. An attempt has been made, where space permitted, to represent as many species as possible of the same family on the same plate, drawn to the same scale. A short description is given of each of the various species represented as well as notes on their distribution, nest and eggs, food, song, and habits.

The control of imported pests recently found in New Jersey, H. B. WEISS (*Jour. Econ. Ent., 11 (1918), No. 1, pp. 122–125*).—Notes are given on the more important insects imported into New Jersey and their control.

[Insects and insect control in Oregon] (*Proc. Wash. State Hort. Assoc., 13 (1917), pp. 99–104, 108–124*).—The several papers relating to insects and their control, here presented, include the following: Codling Moth Conditions of 1916, by R. E. Trumble (pp. 99–104); Spraying Apple Orchards, with Special Reference to Aphis Control, by S. W. Foster (pp. 108–111); Nicotin Sulphate in Codling Moth Control, by F. E. De Sellem (pp. 111–121) (E. S. R., 38, p. 653); and The Strawberry Root Weevil, by A. L. Melander (pp. 121–124), noted on page 864.

Report of the Dominion entomologist for the year ended March 31, 1917, C. G. HEWITT (*Canada Dept. Agr., Rpt. Dominion Ent., 1917, pp. 24*).—This is the usual brief statement of the work of the year (E. S. R., 38, p. 556). An index to the subject matter is included.

Insect pests [in Grenada], F. WATTS (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Grenada, 1916–17, pp. 12, 13*).—A brief report on the more important insect pests of the year.

[Economic insects of Japan] (In *A Collection of Essays for Mr. Yasushi Nawa, [etc.], edited by K. Nagano. Gifu, Japan; Nawa Ent. Lab., 1917, pp. 1–95, pls. 8, figs. 10*).—Among the papers included in this collection of essays written in commemoration of the sixtieth birthday of Y. Nawa are A New Genus of Bark Beetles [Orosiotes], by Y. Niisima (pp. 1–4); Two Species of Termites from Foochow, China, by M. Oshima (pp. 5–7); Three New Species of Trichosiphum in Formosa, by M. Maki (pp. 9–22); Notes on Some Lepidoptera Heterocera of Japan, with Descriptions of Two New Genera [Margaronia and Hirayamaia] and Four New Species, by N. Marumo (pp. 23–37); and Synopsis of the Pemphigidæ of Japan, by S. Matsumura (pp. 39–94). Twenty-nine species of aphids of the family Pemphigidæ representing 19 genera are recognized as occurring in Japan, of which 20 species and 7 genera (Mansakia, Nurudea, Nurudeopsis, Fushia, Gobaishia, Watabura, and Nishiyana) are described as new to science.

War on greenhouse pests, H. A. GOSSARD (*Mo. Bul. Ohio Sta., 3 (1918), No. 2, pp. 55–61, figs. 4*).—A popular account in continuation of that previously noted (E. S. R., 38, p. 762).

Important foreign insect pests collected on imported nursery stock in 1917, E. R. SASSCER (*Jour. Econ. Ent., 11 (1918), No. 1, pp. 125–129*).—This is a summary of information on the insects intercepted during 1917 in the course of State and Federal inspection work.

Notes on insects injurious to coffee, T. J. ANDERSON (*Dept. Agr. Brit. East Africa Bul. 2 (1917), pp. 20–43*).—This consists of brief notes on the more important insects of coffee, with a discussion of control measures.

Insects and camp sanitation, E. P. FELT (*Jour. Econ. Ent., 11 (1918), No. 1, pp. 93–106*).—A general discussion of the subject on which a more extended account by the author has been previously noted (E. S. R., 37, p. 760).

A method of graphically illustrating the distribution of injury by an insect pest, F. Z. Hartzell (*Jour. Econ. Ent., 11 (1918), No. 1, pp. 32–39, figs. 2*).—The method devised by the author is described, the grape flea-beetle being used in giving a practical explanation of its application.

Toxicity of volatile organic compounds to insect eggs, W. Moore and S. A. Graham (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 9, pp. 579–587*).—Investigations conducted at the Minnesota Experiment Station, here reported, are summarized by the authors as follows:

"In general compounds with high boiling point and slight volatility are more effective in dipping and spraying insect eggs than compounds with low boiling point and high volatility. Compounds with low boiling points kill freshly laid eggs more readily than eggs in which the embryo is partially or fully developed. Compounds of higher boiling points are more toxic to eggs with fully developed embryos than they are to eggs in which the embryo is only slightly formed. Kerosene containing both high and low boiling points is destructive to both young and old, but is only slightly toxic to partially developed eggs. The toxicity of the vapor or organic compounds to insect eggs is related to the boiling point and the volatility. As the boiling point increases and the volatility decreases the toxicity increases."

A list of 10 references to the literature is appended.

The influence of molasses on the adhesiveness of arsenate of lead, F. Z. Hartzell (*Jour. Econ. Ent., 11 (1918), No. 1, pp. 62–66*).—In reporting upon the results of adhesive tests it is stated that the success which attended earlier experiments was probably due to the lack of rain immediately following the application of the spray mixture containing molasses. In field work excellent results have been secured from the use of molasses and arsenate of lead in the control of the grape root-worm through studying the weather conditions and applying the spray at a time when there is little probability of rain, and by following the first spraying in about one week with an application of Bordeaux mixture and lead arsenate to act as a repellent to invading beetles which might enter the vineyard during the dispersion period. It is recommended that the weather conditions be observed and the molasses and arsenate of lead mixture applied at a time when freedom from rain is to be expected for at least three or four days.

Spreaders for arsenate sprays, A. L. Lovett (*Jour. Econ. Ent., 11 (1918), No. 1, pp. 66–69*).—In preliminary tests at the Oregon Experiment Station sage tea and a casein lime mixture gave the least burn and approximated the ideal sought for in a spreader.

Appearance of the male Carausius morosus and its longevity, G. Foucher (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 16, pp. 511–513*).—This paper relates to an orthopteran which is a remarkable example of parthenogenicity.

The eggplant lace bug in Porto Rico (Corythucha monacha), R. T. Cotton (*Jour. Dept. Agr. P. R., 1 (1917), No. 3, pp. 170–173*).—An account of studies of *C. monacha*, which is the worst of the many insect pests of the eggplant in Porto Rico.

A key to the species of the genus Ceresa occurring north of Mexico and the description of a new species, E. H. Gibson and Emma Wells (*Bul. Brooklyn Ent. Soc., 12 (1917), No. 5, pp. 110–113*).—A key is given for the separation of 17 species of membracids of the genus Ceresa, known to occur north of Mexico, of which the species *Ceresa militaris* from Missouri is described as new.

Notes on three species of apple leaf-hoppers, F. H. Lathrop (*Jour. Econ. Ent., 11 (1918), No. 1, pp. 144–148, figs. 3*).—This is a brief report of observations at the New York State Experiment Station on the life history and habits

of three important leaf-hoppers attacking apple, *Empoasca mali*, *E. unicolor*, and *Empoa rosæ*.

During the summer and fall of 1915 there was a heavy infestation in the district of western New York about Geneva of *E. mali* and *E. rosæ* was quite common. Their attacks were in evidence in all orchards observed, whereas *E. unicolor* was comparatively rare and no cases of heavy infestation were observed. During the following season, which was fully two weeks later than normal, *E. mali*, though decidedly injurious, was less in evidence than during the preceding season, while *E. unicolor* was exceedingly plentiful, proving to be a true pest and by far outnumbering *E. mali*. *E. rosæ* was again prevalent in 1916, and in spite of its natural enemies did considerable injury.

On apple *E. mali* feeds almost exclusively on the tender terminal growth and shows a marked preference for young, growing trees. *E. rosæ* and *E. unicolor* both largely attack the older leaves, but occur on both old and young trees. *E. mali* causes a severe and characteristic curling of the foliage and resultant injury to the trees. Further experiments must be conducted before any conclusion can be drawn as to their transmission of fire blight.

E. rosæ and *E. unicolor* pass the winter in the egg stage, while *E. mali* hibernates largely if not exclusively in the adult stage.

A graph is given showing the life cycles of the three species as observed at Geneva during the two seasons.

Texas aphid notes, F. B. Paddock (*Jour. Econ. Ent.*, *11* (*1918*), *No. 1*, *pp. 29–32*).—A brief review of observations of plant lice in Texas that have been recorded by the author and others.

A simple means of ascertaining if a sterilizing hut is hot enough to destroy lice and nits in clothing or blankets, A. Bacot (*Brit. Med. Jour.*, *No. 2953* (*1917*), *p. 151*).—The author has found that stearin, which melts at 60° C. (140° F.), is a satisfactory indicator as to the amount of heat and length of time required for destroying lice and nits in clothing and blankets, nits protected by a single thickness of khaki cloth being killed by 15 minutes' exposure to a temperature of 52°. Seven gm. of stearin in a porcelain pot 2.5 in. deep and 2.5 in. in diameter requires 30 minutes to melt, a small portion being still unmelted after 25 minutes; 10 gm. requires between 40 and 50 minutes for melting, only a narrow ring being melted within 30 minutes.

"If two pots, one containing 7 gm. and the other containing 10 gm., are placed or hung slightly below the level of the lowest garments in the sterilizing room, one can be sure, if all the stearin in the 7 gm. pot is melted before the removal of the garments, that the exposure has been sufficient, both as regards period and heat; while, if all the stearin is melted in the pot containing 10 gm., it will show that greater heat or longer exposure than was necessary has been used. . . .

"Nits and stearin were exposed together, and it was found that the stearin was more resistant to these conditions than the nits. For instance, when the temperature was rapidly raised from 21 to 80° within 20 minutes, the nits were killed, while the 7 gm. of stearin was not quite all melted. A rise to the same temperature in 18 minutes showed the same result. A rise to 82° in 15 minutes was just sufficient to melt all the stearin, the nits being killed. Again, a rise in 12 minutes to 81° killed the nits, but left a central disk of stearin unmelted."

Annual reports of the Royal Sericultural Station, Padua, E. Verson et al. (*Ann. R. Staz. Bacol. Padova*, *39–40* (*1911*), *pp. 282, pl. 1, figs. 3*; *41* (*1914*), *pp. 207; pls. 4*; *42* (*1915–16*), *pp. 185, pls. 3, figs. 13*).—These are the usual reports (E. S. R., 25, p. 662) dealing with sericultural investigations. Each includes a list of publications relating to the subject that were issued during the period covered.

The use of phototaxy in selecting from the moment of their birth those larvæ of Bombyx mori most resistant to the disease flacherie, C. Acqua (*Abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 6, pp. 910–912*).—During investigations carried out to determine the action of light on the movements of *B. mori* the author found that the newly-hatched larvæ immediately turn to the source of light and that this movement diminishes during the following days and disappears entirely at the end of the first stage. During the subsequent stages there is an inverse but less energetic movement and the larvæ tend to avoid the light. The larvæ which were most resistant to flacherie were those which from the time of their birth had traveled farthest.

Gipsy moth larvæ as agents in the dissemination of the white-pine blister rust, G. F. Gravatt and G. B. Posey (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 7, pp. 459–462*).—The investigations here reported, which were conducted in 1917 at Kittery Point, Me., with the view of determining the relation of gipsy moth larvæ to the dissemination of the spores of the causal organism of white-pine blister rust (*Cronartium ribicola*), have been summarized as follows:

"The period of hatching and of wind dissemination of gipsy moth larvæ came within the period of spore production of the blister rust on pines. Larvæ fed abundantly on spores and injured the fruiting layer of the pustules so that further spore production was arrested. Larvæ from blister rust cankers had thousands of viable spores on their bodies. A small percentage of the larvæ collected from fly paper and from species of Ribes near infected pines showed æciospores on their bodies. Gipsy moth larvæ were found feeding on leaves of *Ribes* spp., and in some cases the only infected leaves on plants of this genus were those showing insect injury. The Bureau of Entomology has shown (E. S. R., 37, p. 254) that these larvæ are blown by the wind up to a distance of 20 miles. Within this distance the larvæ are potential agents in the spread of the white-pine blister rust (within the area infested by the gipsy moth)."

The apple ermine moth, P. J. Parrott (*Jour. Econ. Ent., 11 (1918), No. 1, pp. 55, 56*).—In an earlier report from the New York State Experiment Station (E. S. R., 23, p. 657) the author dealt with the cherry ermine moth (*Yponomeuta padellus*) which was imported on cherry seedlings. An associated species, the apple ermine moth (*Y. malinella*), has since been observed in New York on apple, and in the present paper notes on its identity and distribution in nurseries are presented. Since 1910 it has been discovered each year in plantings of foreign stock in New York, but has not been reported from outside the State, except in New Brunswick. Whether the two forms represent distinct species or are only varieties of the same species remains to be determined.

The imported cabbage worm in Wisconsin, H. F. Wilson and L. G. Gentner (*Jour. Econ. Ent., 11 (1918), No. 1, pp. 79–81, pls. 2*).—"While Paris green gives efficient control the cost is too high for economical use. Lead arsenate and calcium arsenate at the rate of 1 lb. of the powder or 2 lbs. of the paste to 50 gal., with the addition of 1 lb. or more of common laundry soap, give efficient control and are the most economical to use. The failure of zinc arsenite to control the cabbage worm is not understood and further experiments will be made. No trace of arsenic was found to be present on sprayed heads prepared for cooking even when sprayed as late as a week before picking. The outer leaves may carry enough arsenic to poison stock and are therefore dangerous to use for that purpose."

Nicotin sulphate an effective ovicide for codling moth eggs, A. L. Lovett (*Jour. Econ. Ent., 11 (1918), No. 1, pp. 149, 150*).—The author first refers to

the successful results obtained by De Sellem at North Yakima, Wash., in the control of the codling moth through the use of nicotin sulphate (E. S. R., 38, p. 653). See also abstract noted on page 857. Experiments conducted by the author and briefly reported upon show that nicotin sulphate is an effective ovicide for codling moth eggs and that the addition of soap renders it practically perfect in this regard.

Some experiments on the adults and eggs of the peach tree borer, Sanninoidea exitiosa, and other notes, A. Peterson (*Jour. Econ. Ent., 11 (1918), No. 1, pp. 46–55, figs. 2*).—This is a report of studies at the New Jersey Experiment Stations, particularly of control measures, made during the summer of 1917, near Clementon, N. J., in a heavily infested 80-acre orchard of seven- to eight-year old peach trees of different varieties.

Data relating to the repellent effect of various sprays during oviposition, the effect of sprays on eggs, etc., are reported in tabular form. The results obtained indicate the improbability of developing a poison bait for the adult, the partial repellent effect of certain chemicals on the female while ovipositing, and the partial destruction of eggs when certain substances are applied as a spray. While experiments under way on the use of various chemical and mechanical tree protectors do not as yet warrant a statement, the author is of the opinion that the peach borer trouble will be solved through the finding of some mechanical or chemical barrier that will prevent its gaining entrance or will kill the larva before it enters the tree.

The striped peach worm, H. G. Ingerson (*U. S. Dept. Agr. Bul. 599 (1918), pp. 14, pls. 4*).—This is a report of biological and control investigations of *Gelechia confusella* (*Depressaria persicæella*) conducted during 1915 and 1916 in Michigan at Benton Harbor, the only State in which the species is known to occur.

This lepidopteran, first described by Chambers in 1875 from an unknown locality, has received but little notice as an economic species. While not at present a major pest of peach, it has been observed feeding on sand cherry (*Prunus pumila*), its only other plant host, in such numbers as to web nearly every terminal and partially defoliate it, thus indicating a possibility of extensive injury to peach orchards. The larvæ feed either singly or gregariously on both host plants and though not voracious feeders include in their webs much foliage that is not used as food. Their webbing commences directly after hatching, even before they feed, which takes place next to the midribs of the leaves, small irregular holes first being eaten through the parenchyma and later either or both leaf surfaces being skeletonized. The injury to the peach is caused by the feeding of the larvæ on the foliage. The webs which they spin are loose and often very conspicuous, but the leaves included in the webs soon become dry and cease to function.

At Benton Harbor there was one full brood and a partial second, the earliest emergence of moths in 1916 taking place May 22, and emergence being quite regular from June 5 to July 14. Moths placed in jars with peach foliage and fruit deposited eggs both on the fruit and under the scales surrounding the attachment of the peach to the stem. In observations of 118 eggs the period of incubation varied from 10 to 19 days, with an average of 13.18 days. The feeding period of the transforming first brood larvæ reared in cages varied from 22 to 36 days, with an average of 29.6 days for transformation; of wintering first brood larvæ, 22 to 48 days, with an average of 34.2 days. The cocoons of the first brood are formed in the soil at an average depth of 0.5 in. The average length of the period in the cocoon was 12.4 days, the longest period 21 days, and the shortest 9 days. The first brood moths were emerging in 1915,

from August 4 until September 12, with the largest number on August 10. From 683 larvæ collected on sand cherry on July 28, only two moths subsequently emerged during the season, one on August 28 and the other on September 9. Oviposition of the first brood moths took place in 1915, from August 15 to 19. The second brood eggs began to hatch in 1915 on August 31, and continued to hatch until September 3, the average incubation period being 15.6 days. The larvæ were observed feeding from August 23 to November 14, the maximum length of the feeding period being 74 days, the minimum 39 days, and the average 52.1 days. While cocooning normally takes place in the soil, 13 of 361 individuals recorded pupated in the webbed foliage in which they had lived as larvæ.

A number of parasites were reared, including four ichneumonids, namely, *Angitia discoocellellæ, Cremastus forbesii. Cremastus* sp., and *Epirus indigator;* three braconids, *Apanteles gelechiæ, Ascogaster carpocapsæ,* and *Epirhyssalus atriceps;* two tachinids, *Exorista pystc* and *Frontina ancilla;* and one bombyliid, *Anthrax lateralis.*

In spraying experiments where arsenate of lead powder at the rate of 1 lb. to 50 gal. of water was employed 5 per cent of the terminals were webbed, where used at the rate of 1.5 lbs. to 50 gal. of water, 3 per cent were webbed, whereas with the unsprayed checks 90 per cent were webbed. It is suggested that the occurrence of this pest may be so local as to be remedied by cutting out the infested terminals or branches, and that it will probably not occur in damaging numbers in orchards sprayed regularly with arsenicals for control of the plum curculio.

Notes on the strawberry leaf-roller (Ancylis comptana), R. L. Webster (*Jour. Econ. Ent., 11 (1918), No. 1, pp. 42–46*).—This paper consists of brief notes on the biology of the strawberry leaf-roller, a more complete account of which is being issued in bulletin form.

Notes on the biology of the Angoumois grain moth, Sitotroga cerealella, J. L. King (*Jour. Econ. Ent., 11 (1918), No. 1, pp. 87–93, figs. 2*).—This is a report of biological studies at a field station located at York, Pa., in the southeastern part of the State. In this section the wheat production is about one-third of the total grown in the State, and it suffers an aggregate annual loss from insect injury of over a million dollars. A diagram is given which shows the appearance of the several broods during the year. It is pointed out that the practice of storing unthrashed wheat in the mow is responsible for much of the loss, and the importance of thrashing as soon after harvesting as possible and storing the grain in tight granaries or in good sacks is emphasized.

The apple leaf-mining case bearer (Coleophora volckei n. sp.) W. H. Volck (*Mo. Bul. Com. Hort. Cal., 6 (1917), No. 11–12, pp. 463–467, figs. 6*).—These notes relate to the life history and habits of a new tortricid to be described by Heinrich under the name of *Coleophora volckei.* Its injury, which consists of one or more small punctures in the skin extending a short distance into the pulp, has been more or less in evidence on Pajaro Valley apples at harvest time for several years past. General observations indicate that nicotin sulphate is capable of a very marked control of *C. volckei*, but that the control of the codling moth or fruit-tree leaf-roller is not so good as with arsenicals.

Malaria control.—A report of demonstration studies conducted in urban and rural sections, R. C. Derivaux, H. A. Taylor, and T. D. Haas (*Pub. Health Serv. U. S., Pub. Health Bul. 88 (1917), pp. 57, pls. 17, figs. 7*).—A report of demonstration studies in malaria control conducted by the Public Health Service in cooperation with the International Health Board during 1916 in two highly endemic localities in southeastern Arkansas.

Relation of kinds and varieties of grain to Hessian fly injury, J. W. McColloch and S. C. Salmon (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 8, pp. 519–527*).—This is a preliminary report of investigations conducted at the Kansas Experiment Station.

The authors find that the Hessian fly is able to discriminate between different kinds and varieties of grain. "Eggs were laid on all the kinds and varieties of grain studied, but very sparingly on winter oats, winter barley, einkorn, spring emmer, spelt, and durum spring wheat. On the average, fewer eggs were laid on soft winter wheat than on hard red winter wheat, but exceptions in both cases were found. There appeared to be a large mortality of eggs or larvæ on all kinds and varieties studied. This appeared to be greatest for rye, einkorn, spring emmer, winter oats, and Illini Chief wheat. Very few flaxseeds were found on winter barley, and on Beechwood Hybrid, Currell Selection, and Dawson Golden Chaff wheats."

Early spring Syrphidæ in California and a new Pipiza, W. M. Davidson (*Ent. News, 28 (1917), No. 9, pp. 414–419, fig. 1*).—In addition to observations on the occurrence of syrphids in spring, the author describes a new species under the name *Pipiza californica*. The larva of this species is aphidophagous, having been found to feed upon the sexes of *Pemphigus populicaulis*.

Poisoned bait for the onion maggot, N. F. Howard (*Jour. Econ. Ent., 11 (1918), No. 1, pp. 82–87, pls. 2*).—This is a report of investigations carried on by the Bureau of Entomology of the U. S. Department of Agriculture in Wisconsin in continuation of those previously noted at the Wisconsin Experiment Station by Sanders (E. S. R., 33, p. 357) and by H. H. P. and H. C. Severin (E. S. R., 34, p. 360). The results obtained have led to the following summary:

"For two seasons the poisoned bait for the onion fly has given decidedly negative results. Failure was due, to a great degree, at least, to adverse climatic conditions. These conditions are normal to this section of the country, however, and to other onion-growing districts. In sections where the onion fly occurs and where climatic conditions are more favorable to poisoned bait applications, further trial is strongly recommended."

Meigenia floralis, a parasite of the black alfalfa-leaf beetle (Colaspidema atrum), Lécaillon (*Compt. Rend. Acad. Agr. France, 3 (1917), No. 30, pp. 881–885*).—This tachinid (*M. floralis*), a parasite of the asparagus beetle, each year destroys large numbers of the chrysomelid beetle *C. atrum*.

Control of the common white grub, R. T. Cotton (*Porto Rico Dept. Agr. Sta. Circ. 12 (1918), pp. 7, figs. 2; Spanish Ed., pp. 7, figs. 2*).—A brief summary of information relative to the control of *Phyllophaga vandinei* and *P. portoricensis*, an account of which by Smyth has been previously noted (E. S. R., 38, p. 767). Collecting the white grubs and the beetles is said to be the best method of control now known.

Studies on the life history of two Kansas Scarabæidæ, W. P. Hayes (*Jour. Econ. Ent., 11 (1918), No. 1, pp. 136–144*).—This is a report of morphological and biological studies at the Kansas Experiment Station of two white grubs, *Cyclocephala villosa* and *Anomala binotata*.

The life cycle of *C. villosa* is one year. Adults appear at lights in June, July, and early August. Eggs, which are laid in soil, hatch in from 9 to 25 days. The winter is passed in the larval stage, which stage was found to average 347 days. The pupal stage varied in length from 8 to 24 days.

The adults of *A. binotata* are injurious to fruit-producing plants, and the grubs are minor pests of corn, wheat, and oats. The winter is passed in the adult stage. Eggs are laid in the spring and soon hatch, producing larvæ whose average time of development was found to be 83 days. The pupal

stage lasts on an average 16 days. The adults transform in the fall and remain in their pupal cells until the following spring, thus completing a one-year life cycle.

Lists of references to the literature on the two species are included.

Notes on the habits and metamorphosis of Lepidiota frenchi, E. JARVIS (*Bur. Sugar Expt. Stas. Queensland, Div. Ent. Bul. 5 (1917), pp. 14, figs. 29*).—This beetle is said to rank second to the gray-back cockchafer in economic importance among the scarabeids affecting sugar cane in Northern Queensland. It feeds habitually on the roots of native cereals and other herbaceous plants and has acquired a liking for cane.

Insecticide tests with Diabrotica vittata, N. F. HOWARD (*Jour. Econ. Ent., 11 (1918), No. 1, pp. 75–79*).—In tests in 1916 at Madison, Wis., of Bordeaux mixture (2 : 4 : 50) and lead arsenate paste (4 : 50) combined, against the spotted cucumber beetle the efficiency of the spray was about 25 per cent. The average efficiency of insecticides, based upon two seasons' results, is as follows: Zinc arsenite 24 per cent, lead arsenate 17, sweetened lead arsenate 17, Paris green 16, zinc arsenate 14, Bordeaux-lead arsenate 14, lead arsenate dust 9, cobalt arsenate 4, calcium arsenate 1, and arsenic bisulphid 0 per cent.

Life history of Haltica jamaicensis, R. T. COTTON (*Jour. Dept. Agr. P. R., 1 (1917), No. 3, pp. 173–175*).—An account of the largest of the flea-beetles found in Porto Rico, which at times is extremely abundant. Though it now confines its attention to weeds of the genus Jussiæa, it occasionally feeds on garden beans.

Sweet potato root borer (Cylas formicarius), W. E. HINDS (*Alabama Col. Sta. Circ. 37 (1918), pp. 3–8, figs. 9*).—This circular, which is intended primarily as a warning against the sweet potato root borer, gives a brief summary of information regarding it. Quarantine against the pest is announced by the Alabama State Board of Horticulture and the rules and regulations relating thereto are presented.

Weevils which affect Irish potato, sweet potato, and yam, W. D. PIERCE (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 9, pp. 601–611, pls. 7*).—Notes are first presented on three important Andean weevil pests which affect Irish potato tubers, namely, *Rhigopsidius tucumanus, Premnotrypes solani*, and *Trypopremnon latithorax*, descriptions of which have been previously noted (E. S. R., 30, p. 459), and a table for the identification of Irish potato tuber weevils in the field is also given. A description of the larva of *T. latithorax* follows, and a fourth potato tuber weevil from Cuzco, Peru, *T. sanfordi*, is described as new to science.

Four species of weevils are described as attacking the tubers of the sweet potato (*Ipomœa batatas*), namely, the sweet potato weevil (*Cylas formicarius*), *C. turcipennis, C. femoralis*, and the scarabee (*Euscepes batatæ*), the first-mentioned being the only one of the four to occur in the United States, though *E. batatæ* occurs in the West Indies, including Porto Rico, and in Hawaii, Guam, and Brazil. A weevil which attacks the tubers of yams (*Dioscorea batatas*) in Jamaica is described as new under the name *Palæopus dioscoreæ*.

The strawberry root weevil, A. L. MELANDER (*Proc. Wash. State Hort. Assoc., 13 (1917), pp. 121–124; Better Fruit, 12 (1918), No. 11, pp. 7, 8; abs. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 12, p. 579*).—This is an account of the strawberry root weevil (*Otiorhynchus ovatus*), which was introduced from Europe some 50 years ago and which now occurs in the Northern States and is particularly injurious in British Columbia. The pest first appeared in Washington State in 1904 and has now invaded the principal berry regions of the State. Studies of the pest in British Columbia by Treherne have been previously noted (E. S. R., 37, p. 568).

In control work good results were obtained with carbon bisulphid. The infested parts of rows were covered with a 30 ft. strip of canvas or cloth sheeting made gas-tight by painting with linseed oil, under which at intervals of 5 ft. saucers, each containing ⅝ oz. of carbon bisulphid, were placed. When necessary, the canvas was raised above the saucers by wooden props to allow of free evaporation and made air-tight at the edges by earth shoveled on it. The fumes penetrate the soil to the depth of several inches and kill the adults, larvæ, and pupæ, as well as wireworms, tipulids, and other insects. It is best applied during the few days after the crop is gathered, before migration and egg-laying begin.

The agricultural situation for 1918.—IV, Honey.—More honey needed (*U. S. Dept. Agr., Off. Sec. Circ. 87* (*1918*), *pp. 8*).—Attention is called to the importance of enlarging the number of colonies of bees wherever possible. The opportunity for expansion of beekeeping is pointed out and the factors in successful beekeeping briefly considered.

Rearing queen bees in Porto Rico, R. H. Van Zwaluwenburg and R. Vidal (*Porto Rico Sta. Circ. 16* (*1918*), *pp. 12, figs. 5*).—This circular, which is based largely on Bulletin 55 of the Bureau of Entomology of the U. S. Department of Agriculture (E. S. R., 17, p. 885), gives directions for the rearing of queen bees in Porto Rico. It is pointed out that degenerated stock is the principal cause of poor honey production in Porto Rico, and that this fault can be remedied only by the introduction of fresh stock to be used as a basis for improving the standard of the apiary by constant and intelligent selective queen breeding.

Bee disease control, E. G. Carr (*N. J. Dept. Agr. Circ. 3* (*1917*), *pp. 30, pls. 11*).—A report upon the occurrence of and control work with bee diseases in New Jersey, accompanied by maps which show the results of bee inspection work for the years 1912 to 1916, inclusive.

On three new parasitic acari, S. Hirst (*Ann. and Mag. Nat. Hist., 8. ser., 20* (*1917*), *No. 120, pp. 431–434*).—*Chirodiscoides caviæ* n. g. and n. sp. from the guinea pig, *Demodex muscardini* n. sp. from dormice (*Muscardinus avellanarius*), and *D. erinacei* n. sp. from an English hedgehog are here described.

Scale feeding habits of a Porto Rican milliped, Rhinocricus arboreus, R. T. Cotton (*Jour. Dept. Agr. P. R., 1* (*1917*), *No. 3, pp. 175, 176*).—This milliped has been found to feed upon scale insects in Porto Rico, the purple scale being preferred.

FOODS—HUMAN NUTRITION.

Commercial stocks of miscellaneous animal food products in the United States on August 31, 1917 (*U. S. Dept. Agr., Office Sec. Circ. 101* (*1918*), *pp. 19, figs. 15*).—"Commercial stocks of cured hams, bacon, and shoulders in the United States on August 31, 1917, the date of the preliminary War Emergency Food Survey, were approximately 488,000,000 lbs. Nearly 85 per cent of these stocks were held by the meat packers. . . .

"The reports giving data for both August 31, 1917, and August 31, 1916, indicated an increase of 0.8 per cent in the total holdings. This net increase was due almost entirely to an increase in the holdings of storage warehouses.

"The stocks of cured and salted pork amounted to 215,000,000 lbs., the meat packers holding nearly 75 per cent of the total. . . . The stocks reported for 1917 were 5.5 per cent larger than those reported for 1916.

"The stocks of salted and cured beef amounted to 57,000,000 lbs., of which nearly seven-tenths were held by the meat packers. . . . A 35 per cent increase in total stocks of the United States was indicated for the year ending August 31, 1917.

"The holdings of dry-salted and cured fish, and fish in brine, amounted to approximately 115,000,000 lbs. About 51 per cent of these stocks were held by fish packers and wholesale fish dealers, and 30 per cent by storage warehouses. . . . There was an increase of about 6 per cent over the holdings of the previous year.

"Stocks of condensed and evaporated milk totaled 390,000,000 lbs. Condenseries and wholesale dealers each held about 30 per cent of the total stocks. Retail dealers held about 13 per cent, while storage warehouses and exporters held 11 per cent and 9 per cent, respectively. . . . The 1917 stocks were 77.5 per cent larger than those of 1916."

The supply of lard in the United States.—Its extent and distribution on August 31, 1917 (*U. S. Dept. Agr., Office Sec. Circ. 97* (*1918*), *pp. 32, figs. 12*).—"This circular presents the results of the War Emergency Food Survey of August 31, 1917, so far as they relate to pure lard, lard compounds, and lard substitutes other than purely vegetable substitutes. For convenience, the term 'lard' has been used to designate this entire group of food products.

"The survey indicates that the total stocks of lard in the possession of commercial concerns on August 31, 1917, were approximately 240,000,000 lbs. Of the total reported supply the meat packers held slightly more than 50 per cent; the wholesalers held, roughly, 16 per cent; the retail dealers, 14 per cent; the storage warehouses, 10 per cent; and the bakers and a group of miscellaneous dealers, 10 per cent.

"The survey further indicates that the total stocks on hand August 31, 1917, were 6.3 per cent larger than stocks held on the corresponding date of 1916."

The supply of canned salmon in the United States.—Its extent and distribution on August 31, 1917 (*U. S. Dept. Agr., Office Sec. Circ. 98* (*1918*), *pp. 13, figs. 6*).—Detailed information concerning the extent and the distribution of the supply of canned salmon on August 31, 1917, is presented.

The commercial stocks amounted to approximately 310,000,000 lbs., an increase of 18.2 per cent over the previous year. Four-fifths of the stocks were located in the State of Washington, and nearly three-fifths were held by canners of sea food.

Commercial stocks of miscellaneous cereal and vegetable foodstuffs in the United States on August 31, 1917 (*U. S. Dept. Agr., Office Sec. Circ. 99* (*1918*), *pp. 28, figs. 24*).—Commercial stocks of several foodstuffs on August 31, 1917, are listed in this contribution from the Bureau of Markets. The total holdings were, for corn, 13,664,582 bu.; corn food products, 200,806,674 lbs.; beans, 3,212,749 bu.; rolled oats, 76,976,273 lbs.; rice, 192,124,953 lbs.; sirup and molasses, 43,571,916 gal.; vegetable oils, 36,631,369 gal.; and solid vegetable cooking fats, 35,529,611 lbs. The 1917 stocks for corn were 43.8 per cent smaller than in 1916, stocks of beans practically equal, and stocks of other foodstuffs from 12.3 to 42 per cent larger in 1917.

Sugar supply of the United States.—Its extent and distribution on August 31, 1917 (*U. S. Dept. Agr., Office Sec. Circ. 96* (*1918*), *pp. 55, figs. 19*).—This circular presents the results of the War Emergency Food Survey. It "indicates the sources of the country's sugar supply, the estimated extent of sugar shortage on the date of the survey and the probable reasons therefor, and the distribution of the existing stocks as compared with that of a year ago." Detailed information is given in the circular regarding the distribution of the stocks of sugar not only among the several classes of concerns from which information was secured, but also among the several States and the different sections of the country.

"On the basis of the returns from the survey, it is estimated that the stocks of sugar in commercial channels on August 31, 1917, were about 1,500,000 lbs., as compared with 2,000,000 lbs., on August 31, 1916."

Commercial stocks of wheat and flour in the United States on August 31, 1917 (*U. S. Dept. Agr., Office Sec. Circ. 100* (*1918*), *pp. 37, figs. 17*).—"Total commercial stocks of wheat in the United States on August 31, 1917, the date of the preliminary War Emergency Food Survey, were approximately 75,000,000 bu., representing less than a two-months' supply.

"Of the stocks reported, more than four-fifths was held by elevators, mills, and wholesale grain dealers. The West North Central division of States, reported about one-third of the stocks of the entire country, while the East North Central and the Pacific divisions each reported about one-fifth of the total.

"About five-sixths of the reports, based on quantity reported, gave data not only for August 31, 1917, but also for the corresponding date of 1916. From these two-year reports it appears that the stocks of August 31, 1917, were only 36.9 per cent of the stocks on hand August 31, 1916.

"Total commercial stocks of flour in the United States on August 31, 1917, based on estimates from the survey, were about 12,000,000 lbs. This represents approximately a six-weeks' supply.

"The largest stocks of flour were reported by the group of flour mills, elevators, and wholesale grain dealers, which held a total of 3,633,653 bbls. Retail dealers held 2,456,826 bbls., and bakers 1,999,583 bbls. Five States held one-third of the total stocks of flour. These in order of their holdings were: New York, Pennsylvania, Illinois, Nebraska, and California.

"The stocks reported for August 31, 1917, were 75.7 per cent of those for August 31, 1916. The decrease in holdings was general among all groups and classes of concerns."

Use of wheat-saving cereals, Helen L. Green, Alice E. Skinner, and Lenore Richards (*Kans. State Agr. Col. Circ. 9* (*1918*), *pp. 12*).—In this circular, issued by the Subcommittee on Food Production and Food Conservation of the Women's Committee, Kansas State Council of Defense, recipes for the use of wheat-saving cereals are given, most of which make use of corn meal or corn flour, the substitutes most available for the Kansas housewife.

Hints to housewives on how to buy; how to care for food; meats; drippings and butter substitutes; substitutes for meats; fish; vegetables; cereals; bread; how to use left-overs; how to make soap; fireless cooker; canning fruits and vegetables; how to preserve eggs (*New York, N. Y.: Mayor Mitchel's Food Supply Committee, 1917, pp. 111*).—A general discussion of foods with recipes.

Ninth biennial report of the Food and Drug Department (*Kentucky Sta. Food and Drugs Bien. Rpt., 9* (*1915–1917*), *pp. 10*).—This gives a report of the work under the Kentucky Food and Drugs Act and the Kentucky Food Sanitation Act from July 1, 1915, to June 30, 1917.

[Food and drug inspection], E. F. Ladd and Alma K. Johnson (*North Dakota Sta. Spec. Bul., 4* (*1917*), *No. 18, pp. 437–538*).—The sanitary inspection score card used in 1917 for all food producing and handling establishments in the State of North Dakota is given, also the names of firms and their ratings.

Annual report of the dairy and food commissioner of Wisconsin (*Ann. Rpt. Dairy and Food Comr. Wis.* [*1915*], *pp. 98*).—The work of the commissioner during the year ended June 30, 1915, is reported.

Digestibility of some nut oils, A. D. Holmes (*U. S. Dept. Agr. Bul. 630* (*1918*), *pp. 19*).—In this, the fourth of the series of bulletins dealing with the

digestibility of fats and oils (E. S. R., 36, p. 860), data regarding the digestibility of almond, black-walnut, Brazil-nut, butternut, English-walnut, hickory-nut, and pecan oils are reported. As in the former experiments, normal young men served as subjects and the nut oils studied were incorporated in a basal ration. The results are summarized as follows:

An average of 70 gm. of almond, 56 gm. of black-walnut, 81 gm. of Brazil-nut, 43 gm. of butternut, 78 gm. of English-walnut, 95 gm. of hickory-nut, and 104 gm. of pecan oil was eaten per subject per day in the experiments, out of a total of 71 gm., 68 gm., 84 gm., 46 gm., 80 gm., 97 gm., and 107 gm. of fat supplied by the respective diets. The oils were found to be well digested, the coefficients of digestibility being 97.1 per cent for almond oil, 97.5 per cent for black-walnut oil, 96.3 per cent for Brazil-nut oil, 95.4 per cent for butternut oil, 97.6 per cent for English-walnut oil, 99.3 per cent for hickory-nut oil, and 96.8 per cent for pecan oil.

The nut oils, which are liquid at ordinary temperatures, thus have practically the same digestibility as the common vegetable oils (cottonseed, peanut, olive, sesame, and coconut oils), which are also liquid at ordinary temperatures.

While in these experiments as much as 81 gm. of almond oil, 64 gm. of black-walnut oil, 100 gm. of Brazil-nut oil, 49 gm. of butternut oil, 109 gm. of hickory-nut oil, and 130 gm. of pecan oil were eaten per day by one of the subjects for a 3-day test period, no laxative effect was noted; accordingly the limits of tolerance for these fats seems in excess of these amounts. In the experiments with English-walnut oil the three subjects ate 69.9 gm., 83.8 gm., and 81.6 gm. per day, and all reported a slight laxative effect.

The values obtained for the digestibility of the protein and carbohydrates in the simple mixed diet eaten in conjunction with the different nut oils were in agreement with those obtained in the earlier experiments of this series, indicating that the nut oils did not exert any unusual influence on the digestibility of the foods eaten with them.

"The results of this study of the digestibility of these nut oils indicate that they are very well assimilated by the human body, and that whenever available they could be used freely for food purposes."

Bacteria in ice cream.—II, B. W. HAMMER and E. F. GOSS (*Iowa Sta. Bul. 174 (1917), pp. 21*).—A continuation of the study of bacteria in ice cream (E. S. R., 28, p. 166) is reported. The following conclusions were reached by the authors:

"The freezer may be an important source of contamination where an effort is being made to produce ice cream with a low bacterial count, and accordingly considerable attention should be given its care. Water sherbets contain but few bacteria compared to the number ordinarily found in ice cream. The counts on 17 samples ranged from 6 to 7,800 per cc. Ice cream other than vanilla ordinarily contain large numbers of bacteria. The counts on 13 samples ranged from 130,000 to 40,850,000 per cc. There is no evidence that there is an increase in the numbers of contained organisms during the proper storage of ice cream while commonly there is a decrease. These results apply to the organisms developing on agar held at 37° C. for 48 hours.

"There is an apparent increase in the number of bacteria as determined by the plate method during the freezing of ice cream. This is apparently due to the breaking up of the clumps of organisms as a result of the agitation in the freezer. There is usually a decrease in the number of bacteria in ice cream during the hardening process, presumably as a consequence of the destructive action of the lowered temperatures.

"The softening and rehardening of ice cream may result in a significant increase or in a decrease in the number of bacteria contained. The effect is

probably dependent on the types of bacteria present and on the extent of the softening, a decrease being more likely to occur when the ice cream is softened at a higher temperature since, under these conditions, the rehardening has a more destructive action."

The dietary deficiency of cereal foods with reference to their content in "antineuritic vitamin," C. VOEGTLIN, G. C. LAKE, and C. N. MYERS (*Pub. Health Rpts.* [*U. S.*], *33* (*1918*), *No. 18, pp. 647–666, figs.* 7).—The report deals with the occurrence of the antineuritic vitamin (water-soluble B) in corn and wheat. Experiments were made on laboratory animals (chickens and pigeons) to determine whether bread made from "white" flour or highly-milled corn meal includes all the essential food elements contained in the intact grain. The following conclusions are reached:

"The results obtained in this investigation clearly show that for pigeons an exclusive diet of whole wheat or corn furnishes an adequate supply of antineuritic vitamin. The antineuritic vitamin seems to reside in the peripheral layers and the germ of these seeds, whereas the endosperm is relatively poor in this substance.

"If wheat and corn foods containing only a small percentage of the peripheral layers and germ of the seed are fed to pigeons and chickens exclusive of other food, polyneuritic symptoms appear on an average of three weeks after the beginning of the feeding period. The appearance of polyneuritis is preceded by a gradual loss in body weight. The birds can be relieved of their paralysis in a striking way by the oral or subcutaneous administration of a highly-concentrated preparation of antineuritic vitamin derived from 'whole-wheat' bread, yeast, ox liver, rice polishings, or beans.

"The addition of yeast (in amounts use by bakers) in the preparation of bread from highly-milled flour does not prevent the appearance of polyneuritis in birds fed on this food [exclusively], but prolongs slightly the period of incubation. The addition to 'highly-milled' flour, or bread made from 'highly-milled' flour, of a small amount of antineuritic vitamin preparation will correct this particular dietary deficiency, and will prevent the appearance of polyneuritis and the loss of body weight. The total phosphorus content of corn and wheat foods is a fairly satisfactory index of the amount of antineuritic vitamin contained in these foods. In a general way, it can be said that a high total phosphorus content is an indication that the particular corn or wheat product is relatively rich in antineuritic vitamin."

The origin of creatin.—II, L. BAUMANN and H. M. HINES (*Jour. Biol. Chem.*, *31* (*1917*), *No. 3, pp. 549–559*).—Continuing previous work[1] this article reports experiments made to determine whether the animal organism possesses the power to convert glycocyamin into creatin.

The authors conclude that their experiments offer no "evidence for the methylation of glycocyamin by muscle or liver tissue in vitro. The injection of glycocyamin into rabbits and dogs may be followed by an increased excretion of creatin."

The effect of starvation on the catalase content of the tissues, W. E. BURGE and A. J. NEILL (*Amer. Jour. Physiol.*, *43* (*1917*), *No. 1, pp. 58–61*).—Experiments made upon 12 laboratory animals (rabbits) led the authors to conclude that the "catalase content of the heart, which is not autolyzed during starvation, remains normally high while the catalase content of the fat and skeletal muscles, which are autolyzed during starvation, is greatly decreased. In view of the fact that the catalase content of a muscle is directly proportional to the amount of oxidation in the muscle, and that the autolyzing

[1] Jour. Biol. Chem., 22 (1915), No. 1, pp. 49–53.

enzyms are destroyed by oxidation, the further conclusion is drawn that the heart is not autolyzed during starvation, because oxidation in this organ remains normally intense, and thus provides for this oxidation of the autolyzing enzyms and the maintenance of the normal balance between oxidation and autolysis; on the other hand, the fat and skeletal muscles are autolyzed during starvation because of the decreased oxidation, which leaves the autolytic enzyms free to digest these tissues."

The effect of thyroid feeding on the catalase content of the tissues, W. E. Burge, J. Kennedy, and A. J. Neill (*Amer. Jour. Physiol., 43 (1917), No. 3, pp. 433–437*).—The object of this investigation was to determine whether thyroid feeding increases the catalase content of certain tissues, which would account for the increased oxidation of animals fed thyroid, while in other tissues, such as the muscles and fat, it causes a decrease in oxidation, which would account for the increased autolysis in these tissues. Experiments were made with cats. The following conclusions were reached:

"Thyroid feeding increases the catalase of the blood and decreases it in the heart and probably in the fat and skeletal muscles. The increased catalase of the blood may account for the increased oxidation in animals to which thyroid is fed, while the decreased catalase in the heart, skeletal muscles, and fat may account for the increased autolysis in these tissues, the idea being that when oxidation is decreased in these tissues a smaller amount of the autolyzing enzyms is oxidized and destroyed, resulting in an increase in the rate of autolysis."

The rôle of catalase in acidosis, W. E. Burge (*Science, n. ser., 47 (1918), No. 1214, pp. 347, 348*).—From observations made upon the catalase content of the blood of animals under conditions of pancreatic diabetes, "surgical shock," anesthesia, and starvation, the conclusion is drawn that the defective oxidation in diabetes and the decreased oxidation in anesthesia, starvation, and "surgical shock," with resulting acidoses," is probably due to the decrease in catalase.

ANIMAL PRODUCTION.

Wintering and fattening beef cattle in North Carolina, W. F. Ward, R. S. Curtis, and F. T. Peden (*U. S. Dept. Agr. Bul. 628 (1918), pp. 53, figs. 8*).—This work, done in cooperation with the North Carolina Experiment Station, covers the results of three years' experiments with beef cattle in the western part of the State. It is deemed applicable to similar conditions prevailing in the mountainous sections of the Virginias, Carolinas, Kentucky, Tennessee, and Georgia. The following studies are reported:

I. *Wintering steers preparatory to grazing on pasture.*—Cattle in the mountainous sections are usually carried through the winter on light maintenance rations and put on pasture the following summer for gains when feed is more abundant. The objects of this experiment were to determine the costs and methods of wintering stock cattle, the value of feeding for the maintenance of weights, and the effects of wintering on the gains on pasture during the following summer. The results cover three years with four lots, the first and second lots averaging 24 head, the third 33, and the fourth 19. Lot 1 was wintered on ear corn, corn stover, hay, and straw; lots 2 and 3 on corn silage, stover, hay, and straw; and lot 4 on winter pasture, being fed dry roughage and corn only when snow was on the ground.

For the three years the steers in lot 1 cost $11.13 to winter, and lost an average of 32 lbs. per head each season, the increased cost per 100 lbs. in the spring being $1.74. Lot 2 cost $7.11 to winter, lost 51 lbs. each, and

had an added cost in the spring of $1.40 per 100 lbs. Lot 3 cost $6.76 to winter, lost 52 lbs. per head per season, and had an added cost of $1.47 per 100 lbs. Lot 4 cost $5.39, gained an average of 20 lbs. per season, and had an added cost in the spring of 68 cts. per 100 lbs. In these experiments the average requirements of pasture for the winter were 1.8 acres per head.

II. *Winter grazing of steers.*—In the second experiment the winter grazing of cattle was tried out on mountain cut-over lands too steep for general agriculture. The coves and flats were seeded to a mixture of 15 lbs. of orchard grass, 4 lbs. of blue grass, and 7 lbs. of timothy and clover per acre sown in corn at its last cultivation. This was allowed to grow during the following summer to make winter pasture. During the three years of the experiment the cattle were put on the pasture late in the fall and were without shelter during the entire winter. During stormy weather it was necessary to feed, this period averaging less than three weeks each season.

The first year 17 cattle on pasture cost $4.66 per head to winter and weighed 17 lbs. heavier in the spring; the second winter 26 head averaged $6.29 to winter and were 17 lbs. heavier; the third winter 16 head averaged $5.23 to winter and weighed 26 lbs. more per head in the spring. The average cost per head for three years was $5.39, approximately one-half of what it cost to dry-feed cattle in the barn, besides showing a gain in weight while the latter showed a loss. Winter grazing and the use of the silo promise greater gains in these rough mountain lands in wintering cattle than the old methods of using dry harvested roughage.

III. *Summer fattening of steers.*—This experiment, carried on for three years, was made with the steers wintered on dry roughage, on dry roughage and silage, and on winter grass. Most of the mountain cattle are finished on grass, but these were finished on grass alone and on grass with cottonseed cake. During the first two summers the feeding of cottonseed cake on grass was profitable, but in the third season it was not so, owing to its high price.

The results show that the cattle that had been wintered on pasture produced the best gains the following summer with an average of 350 lbs. per head at a cost of 3.1 cts. per pound. The next most economical results were made by the cattle wintered on silage, stover, and hay, followed by grass in summer. They made an average gain per head for the summer of 319 lbs. at a cost of 3.9 cts. per pound. The dry-fed wintered cattle on grass the following summer made an average gain of 344 lbs. per steer at a cost of 4.8 cts. per pound. The silage-wintered cattle on summer pasture and cottonseed cake made gains of 328 lbs. at a cost of 6.5 cts. per pound, compared with 3.8 cts. per pound without the cake. The cattle wintered on dry rations during the following summer on pasture made gains of 314 lbs. at a cost of 7.4 cts. per pound with cake, contrasted with gains at a cost of 4.8 cts. per pound without the cake.

IV. *Winter fattening of steers.*—It is the custom in the mountain districts to sell the steers in the fall as feeders. There are, however, oftentimes corn and roughages available for fattening such cattle. These experiments were carried out to test the profitableness of utilizing these home-grown feeds supplemented with cottonseed meal and hulls.

In the winter of 1913–14 one lot of 12 steers was fed cottonseed meal, cottonseed hulls, corn stover, and hay. A second lot of 12 was fed the same plus ear corn. During 113 days the steers in lot 1 averaged an increase daily of 1.36 lbs. per head at a cost of 13.32 cts. per pound, and lot 2, 1.42 lbs. at 13.92 cts. per pound.

In the winter of 1914–15 four lots of steers consisting of 10, 10, 21, and 26 head each were fed. All the animals received cottonseed meal. In addition

those in lot 1 were fed ear corn and cottonseed hulls, in lots 2 and 4 cottonseed hulls, and in lot 3 corn silage. The steers in lots 1, 2, and 3 were fed 96 days, and those in lot 4, 111 days. Those in lot 1 made an average daily increase of 1.61 lbs. per head at a cost of 12.96 cts. per pound; lot 2, 1.42 lbs. at 11.21 cts.; lot 3, 2.07 lbs. at a cost of 7.6 cts.; and lot 4, 1.43 lbs. at a cost of 9.4 cts. per pound.

From the two years' work the following conclusions are drawn, applicable to local conditions: Good hay materially increases the cost of fattening and should be replaced by cheaper roughages where possible. Ear corn increases gains and improves the finish. The cost and availability of corn for fattening cattle should be carefully reckoned and compared with cottonseed meal when rationing. The gains with corn silage in the experiments are striking, and attention is called to the value of corn for ensiling and its utilization in this form in the region for cattle feeding. Cottonseed meal, even in moderate amounts, proved efficient, and it, as also cottonseed hulls, produced economical and satisfactory gains.

Owing to the long shipping distances the shrinkage of these cattle on shipment to market was large. It was fairly uniform on all lots.

Farmers with surplus feed, especially roughages, should feel safe in feeding steers in the winter when the prices of feeders and cottonseed meal are favorable and shipping points for fat cattle are not too far distant.

The utilization of dry farm crops in beef production, L. Foster and H. G. Smith (*New Mexico Sta. Bul. 108 (1917), pp. 34, figs. 6*).—These experiments, carried out in cooperation with the Bureau of Plant Industry of the U. S. Department of Agriculture, covered three winter periods. They were made to determine if local crops grown under dry-farming conditions could be profitably employed in feeding range steers for beef. The feeds used were milo maize, Kafir corn, and other sorghums, and cowpea hay fed dry and ensiled. Cottonseed meal also used was the only feed brought in. The steers were range grown in the neighborhood of Tucumcari, N. Mex., those of the first experiment covering 3-year-olds, those of the second under 17 months old, and those of the third were "long yearlings." Tables are given showing the costs of the locally grown feeds.

In the first experiment two lots of three steers each were fed ground milo maize heads and Kafir corn silage. In addition lot 1 was fed cowpea hay and lot 2 cottonseed meal and shredded Kafir corn stover. The steers in lot 1 made an average daily gain per head for 76 days of 2.84 lbs. at a cost of feed per pound of gain of 4.19 cts. Those in lot 2 made a daily average gain of 2.39 lbs. at a cost per pound of 5.45 cts.

In the second experiment two lots of five steers each were fed the same rations as in the previous experiment. The steers in lot 1 made an average daily gain per head for 122 days of 2.14 lbs. at a cost of 4.78 cts. per pound of gain. Those in lot 2 made an average daily gain of 1.48 lbs. at a cost of 6.07 cts. per pound of gain. The average rate of gain in lot 2 was lowered by the results with one animal which was not a good feeder.

The third experiment was divided into two periods. The first test was made by 10 steers on 48 acres of pasture for 50 days, and being fed in addition 25 lbs. of cottonseed cake daily and as much Kafir corn silage as they would consume up to 200 lbs. They made an average daily gain per head of 1.71 lbs. at a cost per pound of 4.52 cts.

In the second period they were taken off pasture, divided into two lots of five each, and fed for 55 days. They were fed the same feeds as in the previous experiments except that shredded sorghum fodder was substituted for the

shredded Kafir corn stover in lot 2. The steers in lot 1 made an average daily gain per head of 2.07 lbs. at a cost per pound of 5.98 cts. Those in lot 2 made a corresponding gain of 1.51 lbs. at a cost per pound of 8.43 cts.

These experiments indicate that feeds necessary for fattening range cattle with a properly balanced ration can be grown under local dry-farming conditions. Very favorable results are shown with cowpea hay compared with cottonseed meal that must be purchased. It may also take the place of alfalfa. As silage, immature Kafir corn gave satisfactory results. The reservation of native pasture for winter feeding is deemed advisable from the results in the last experiment.

Cattle feeding.—XIII, Winter steer feeding, 1916–17, J. H. Skinner and F. G. King (*Indiana Sta. Bul. 206* (*1917*), *pp. 3–27; popular ed., pp. 8*).—This is a continuation of work previously reported (E. S. R., 36, p. 564). The object of the experiments was to obtain further information on the comparative value of leguminous hay alone and combined with corn silage for fattening cattle; to test the comparative value of clover with alfalfa hay for cattle on full feed; and to test the value of a full feed of corn in the ration with a limited feed of corn combined with corn silage.

In a ration of shelled corn, cottonseed meal, and clover hay, the addition of 33.88 lbs. of silage daily displaced 2.79 lbs. of the corn and 11.46 lbs. of the hay per steer, while the rate of gain was increased 0.19 lb. per head daily and the cost of gain decreased $2.48 per 100 lbs. With the same ration, except that alfalfa hay was used instead of clover hay, 34.21 lbs. of silage daily displaced 3.06 lbs. of corn and 13 lbs. of hay, while the rate of gain per day was lowered 0.15 lb. daily and the cost of gain decreased 41 cts. per 100 lbs. The steers with corn silage in the ration sold for 25 cts. per 100 lbs. higher than those without. The profit per steer, not counting that made by the pigs following, was increased $10.08 each when silage was added to the ration containing clover hay and $6.10 when silage was added to the ration containing alfalfa hay.

Cattle receiving a full feed of shelled corn in addition to a ration of cottonseed meal, corn silage, and clover hay made a daily gain of 2.5 lbs. at a cost of 17.51 cts. per pound of gain. They were valued at $12 per 100 lbs. and made a profit, including that of pigs following, of $35.65 per head. The steers on the same ration but with the corn eliminated consumed 19.33 lbs. of silage and 0.87 lb. of hay more per day. They gained 1.63 lbs. daily at a cost per pound of 14.87 cts., and when fat were valued at $10.75 per 100 lbs. and gave a profit, including pork, of $21.21 per head.

With one-half the corn eliminated the average increased silage consumption was 8.77 lbs. and hay 0.7 lb. daily. The steers gained 1.62 lbs. daily at a cost of 20.97 cts. per pound of gain, were valued at $10.85 per 100 lbs. when fat, and returned a profit, including pork, of $14.95 per head.

In the ration where no corn was fed the first month but afterwards added in increasing amounts to the fifth month when it was 11 lbs. daily per head, the average increased consumption of roughage was 10.15 lbs. of corn silage and 1.97 lbs. of hay daily per head. The steers gained daily 1.91 lbs. at a cost of 18.12 cts. per pound of gain. They were valued at $10.85 per 100 lbs. when fat and yielded a profit, including pork, of $20.53 per head.

In a comparison of clover and alfalfa hays with and without silage, the basal ration was made up of shelled corn and cottonseed meal. With clover hay as the roughage the steers consumed slightly less corn and much less hay than with alfalfa as the roughage. With clover hay they made an average daily gain per head of 2.31 lbs. at a cost of 19.99 cts. per pound of gain, while

those on alfalfa hay gained 2.16 lbs. daily at a cost of 21.77 cts. per pound. The animals on clover were valued at $11.75 per 100 lbs. and returned a profit, not including that of pigs following, of $10.85 per head. Those on alfalfa were valued at the same price and returned a profit of $7.74 per head.

With clover hay and silage in the ration the animals consumed slightly more grain and hay but less silage than with the ration of alfalfa hay and silage. With the clover-silage ration the steers gained an average of 2.5 lbs. daily per head at a cost of 17.51 cts. per pound, while those on alfalfa-silage gained 2.01 lbs. daily at a cost of 21.36 cts. per pound. Valuing the two lots at $12 per 100 lbs. when finished, the clover-silage lot yielded a profit, not including that of pigs following, of $20.93 per head compared with $13.84 for the alfalfa-silage lot.

Digestion of starch by the young calf, R. H. Shaw, T. E. Woodward, and R. P. Norton (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 9, pp. 575–578, fig. 1*).—This investigation was undertaken by the Dairy Division of this Department to ascertain how early in life the calf can utilize starch or starch-containing feeds.

Digestion experiments were conducted with two male calves. Beginning at 4 days of age each calf received 40 gm. of ordinary cornstarch per feeding, mixed with the milk, for a period of 3 days. Following this starch-feeding period the calves were fed whole milk solely for about 5 days, after which the starch was again fed for 3 days. The experiment continued until one calf was 39 days old and the other 31 days old.

From 4 to 7 days of age one of the calves digested 22.02 per cent and the other 20.3 per cent of the starch consumed. When calf 1 was 12 to 15 days old the percentage of starch digested had more than doubled, and when 3 weeks old it had nearly tripled, while at 4 weeks, in the case of calf 1, and 3 weeks, in calf 2, the percentage of starch digested was well over 90.

"While it is quite probable that a calf but a few hours old can not digest an appreciable amount of starch, it can readily be seen that the quantity of starch-splitting enzyms must increase very rapidly in the first few days of life, for the calves under experiment, when only 3 to 4 weeks old, were able to digest a ration nearly 10 per cent of the dry matter of which was starch. These results indicate that the milk ration of a calf but a few days old may be supplemented with a starchy food, and that the starchy material may be rapidly increased as the calf grows older."

The agricultural situation for 1918.—X, Wool.—War makes more sheep and wool necessary (*U. S. Dept. Agr., Off. Sec. Circ. 93 (1918), pp. 14*).—This circular points out the effect of the war upon the requirements and supplies of wool, and gives reasons and plans for the immediate increase of sheep raising in the United States, especially on the ordinary farm. It is stated that before many decades have passed the United States should possess three or four times the present number of sheep, that a doubling of the present number within four years is possible, and that it would be of most valuable assistance to our war interests if such a result could be produced in a shorter time.

[Feeding experiments with pigs], G. S. Templeton (*Alabama Col. Sta. Circ. 38 (1918), pp. 29, 30*).—In a cooperative experiment in Bullock County 60 head of pigs were grazed on peanuts for eight weeks during the fall of 1917. Following the peanut-pasture period 45 head were divided into three lots of 15 each and fed the following rations for five weeks on dry lot: Lot 1, two weeks on corn and tankage and three weeks on corn and cottonseed meal (2:1) in self-feeders; lot 2, corn and velvet beans (4:1); and lot 3, corn and tankage in a self-feeder. The three lots were classified by the packing company to which they were sold as medium soft, indicating that the finishing period increased the

value of the pigs 1 ct. per pound over straight peanut-fed pigs. Lot 3 returned the greatest profit and lot 2 the least profit per head.

[Feeding pigs corn, velvet beans, and peanuts], G. S. TEMPLETON (*Alabama Col. Sta. Rpt. 1917, pp. 23, 24*).—In an experiment in feeding pigs on corn, velvet beans, and peanuts in various combinations, the velvet-bean meal produced a carcass as firm as that of the pigs fed on corn. In appearance the fat was slightly darker. The carcass of the pigs fed on peanut meal and corn (1:1) was somewhat softer than the corn-fed carcass, while that of those fed on peanuts and corn (1:1) was considerably softer.

The influence of the ration upon the intestinal flora of swine, L. D. BUSHNELL and J. J. FREY (*Kansas Sta. Tech. Bul. 3 (1917), pp. 3–54, figs. 3*).—The literature of the relation of bacteria to the development of higher animals, the harmful and beneficial influence of bacteria in the intestinal tract, and the effect of diet upon the intestinal flora is reviewed, and a bibliography of 78 titles is listed.

An investigation was made of the effect of different diets upon the intestinal flora of pigs as shown by the Gram method of staining, and the influence of these diets upon the number and types of bacteria in the feces. A special study was made of the effect of such diets upon the *Bacillus coli* group in the intestinal contents and feces of the pigs. The six pigs used in the studies were given the experimental diet for 200 days from the time of weaning. Four of the pigs were fed corn meal alone, and the other two corn meal plus the albumin from 12 lbs. of milk to each pound of corn meal. Three of the corn-fed pigs gained in weight from an average of 30.6 lbs. each at the beginning of the test to 79 lbs. at the end of the 200 days, while the two corn-and-protein-fed pigs gained from an average of 29.8 to 268 lbs. The fourth pig of the corn-fed group was kept on the corn-meal diet for about 18 months. This pig made only slight gains for 13 months, but during the next 5 months gained about 140 lbs., due mostly to the laying on of fat.

The Gram method was found to be an index to the influence of diet upon intestinal flora only within limits. Observations made upon samples taken from the stomach and at about each 6-ft. level of the intestines to the rectum of two slaughtered pigs showed that the Gram-positive types were more prevalent at lower levels in the corn-and-protein than in the corn-alone pig. *B.-coli*-like organisms were isolated from the stomach and at each level below to the rectum in the corn-alone pig, while in the corn-and-protein pig organisms of this type were not found in the stomach or for about 18 ft. below in the small intestine. All the data obtained indicate that about 10 per cent more organisms are present in the feces of corn-and-protein pigs than in the feces of corn-alone pigs. There were, however, great individual and daily variations. In reference to the types present, there were great individual variations in the mixed intestinal flora, but it was noted that pigs on a corn diet generally show a slightly more simplified flora than pigs fed on a more complex diet.

"There is a tendency for a diet of corn alone to throw the varieties of the colon bacilli into the *B. communis* variety rather than into the *B. communior* variety. This is not due entirely to the physical condition of the feces, as the poverty of *B. communior* was as marked in the contents of the intestine as in the feces. Small variations in diet affect the intestinal flora, but very little as compared to highly carbonaceous or nitrogenous diet. A study of the fermenting capacity of the colon bacilli will not explain the difference in metabolism in pigs on a strict corn diet and one of corn plus milk albumin. It is not possible to attribute the stunting effect of a strictly corn diet to marked variation in the bacterial flora of the alimentary canal as determined by the present technique."

Winter cycle of egg production in the Rhode Island Red breed of the domestic fowl, H. D. Goodale (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 9, pp. 547–574*).—At the Massachusetts Experiment Station the daily egg records of three flocks of Rhode Island Red pullets, hatched, respectively, in 1913, 1915, and 1916, were biometrically analyzed and compared with monthly egg records of White Wyandottes and Barred Plymouth Rocks reported by Gowell from the Maine Experiment Station (E. S. R., 15, p. 394).

The winter cycle was found to be much more characteristic in the Maine Station flocks than in the Massachusetts Station flock. In the case of the Rhode Island Reds the winter cycle could be determined in only a portion of the flock. As to the evidence of a winter cycle in the individual, it is concluded that (1) the rate of production as shown by the monthly egg records is not a satisfactory index of a winter cycle in the individual Rhode Island Red pullet. (2) The best criterion of the existence of a winter cycle in the individual is the existence of a pause in production in one or more of the winter months, followed by a period of continuous egg production, and usually exceeding 10 days in length. (3) In some instances a pause of 10 days or less occurring in February or March, and following a period of several weeks of continuous egg production, may delimit the winter cycle. In cases where winter pauses could be determined with some accuracy, practically no correlation was found between the number of eggs laid before the pause and the length of the pause.

Evidence is presented which indicates that the winter cycle of egg production may be inherited in some definite but undetermined manner.

Successful incubation practices in New Jersey, embryo mortality, R. R. Hannas (*New Jersey Stas. Hints to Poultrymen, 6 (1918), No. 5, pp. 4*).—Among points considered are the location of the machine, the holding of the eggs at a low temperature with moist air in the room, and daily turning, and the operation of the incubator at the proper temperature, with care in turning, cooling, and sanitation.

In a trial in holding eggs with 900 eggs in three lots those kept at 45 to 50° gave 57 per cent hatch; those at 60 to 65°, 51.3 per cent hatch; and those at 75 to 80°, 33.7 per cent hatch.

Cooling seems to make no difference in the percentage in the hatch, but there is possibly a heavier chick produced where it is practiced. From a trial with 1,500 eggs in three lots extreme cooling gave 66.7 per cent hatch, medium cooling 68.8 per cent, and no cooling 65.5 per cent. Those receiving extreme cooling hatched a day late, with medium cooling on time, and with no cooling a day ahead of time. The chicks averaged in weight 1.35, 1.32, and 1.27 oz., for the respective lots.

DAIRY FARMING—DAIRYING.

Feeding for milk production, J. M. Scott (*Florida Sta. Bul. 143 (1918), pp. 79–88, fig. 1*).—Part of the experiments here reported, comparing sorghum silage with Japanese cane silage and with sweet potato silage for dairy cows, has already been noted (E. S. R., 37, p. 683).

In an experiment with three lots of three cows each, covering three 20-day periods, the rations consisted of 9 lbs. of wheat bran and 12 lbs. of silage, and in addition 3 lbs. of cottonseed meal for lot 1, 4 lbs. of peanut meal for lot 2, and 6 lbs. of velvet bean meal for lot 3, these concentrates being changed so that each lot of cows received a different concentrate during each 20-day period. The cows varied but little in live weight during the test. On velvet bean meal the cows produced 2,818.4 lbs. of milk, on peanut meal 2,755.3 lbs., and on

cottonseed meal 2,601.8 lbs. of milk. With peanut meal at $40, velvet bean meal at $32, and cottonseed meal at $50 a ton, milk was produced at 16, 16.5, and 16.6 cts. per gallon, respectively, when these concentrates were fed.

Corn silage and sweet potato silage were fed by the reversal system to two lots of seven cows each during four 16-day periods. In addition, the cows were fed a ration of 2.5 lbs. of cottonseed meal and 7.5 lbs. of wheat bran. Little variation occurred in the weight of the cows during the test. On corn silage the cows gave 7,888.3 lbs. of milk at a cost of 11.8 cts. per gallon, while on sweet potato silage they gave 7,598.4 lbs. of milk, at a cost of 14.2 cts. per gallon. In this test corn silage was valued at $4 and sweet potato silage at $13.33 per ton.

Dairying in Florida, J. M. Scott (*Florida Sta. Bul. 142* (*1918*), *pp. 59–76, figs. 6*).—The author discusses the need for increased dairy production in Florida, especially on the average farm; the factors affecting cost of milk production; the improvement of dairy herds by selection, the use of good sires, and the raising of heifers from the best-producing cows; the effects of feeding stuffs on the color, odor, and composition of milk; qualifications of a good dairyman; and cow-testing associations.

The station herd is cited as an example of what may be accomplished in improving dairy herds by selection and by the use of good sires. Ten years ago the average annual milk production per cow of the 12 cows in this herd was 2,600 lbs. During the past year the average of the 20 cows in this herd was 4,440 lbs. The average total feed and labor cost of producing milk in the station herd during the past year was 19 cts. a gallon.

A study of share-rented dairy farms in Green County, Wis., and Kane County, Ill., E. A. Boeger (*U. S. Dept. Agr. Bul. 603* (*1918*), *pp. 14, fig. 1*).—The material for this study was obtained from 84 farm-management survey records made in Green County, Wis., in cooperation with the Wisconsin Experiment Station, and from 59 records made in Kane County, Ill., all for the crop year 1915, together with data from 147 survey records taken in the Illinois region by the Illinois Station in 1912.

With regard to rental terms, the landlord in the Illinois group generally owned the cows and paid all the farm road tax, while in the Wisconsin group he owned but half the cows and paid only part of the road tax. In the Wisconsin group 76 per cent of the leases ran for one year, none being for more than three years. In the Illinois group 63 per cent of the leases were for one year, none being for more than five years.

The average farm in the Wisconsin group had 140 acres tillable and 84 acres in pasture and supported 25 cows. The Illinois farms averaged 139 acres tillable and 58 acres in pasture and supported an average of 43 cows. The Wisconsin cows produced an average of $70 worth of dairy products, and the Illinois cows $94 worth per head annually. In the Wisconsin group both landlord and tenant made least on farms selling milk fat, more on farms marketing milk through the cheese factory, and most on farms selling milk to condenseries. In the Illinois group none of the milk was made into cheese, and the profits were about the same, both to landlord and tenant, whether the milk was sold to the condensery or for market. The introduction of purebred cows into the dairy herd in the Wisconsin group has been very profitable both to landlord and tenant, but apparently only to the tenant in the Illinois group.

In both the Wisconsin and Illinois groups the tenant remained on the farm longer under the yearly lease than he did where the lease was for a longer period.

Milk goats, E. L. Shaw (*U. S. Dept. Agr., Farmers' Bul. 920 (1918), pp. 36, figs. 18*).—A general treatise on the status of the industry in the United States, the character of goat's milk, and the breeds, breeding, care and management, and diseases of goats.

It has been found that goat's milk can be thoroughly separated in a separator. When goat's milk testing 4.4 per cent fat was run through the separator the skim milk tested only 0.03 per cent fat. The composition of the milk in the Bureau of Animal Industry's herd of common American goats averaged the following percentages: Specific gravity, 1.0338; fat, 5.99; solids-not-fat, 10.97; sugar, 4.93; protein, 4.63; and water, 83.04. Tests indicate that when goat's milk and cream are properly handled butter of a good quality and free from objectionable features may be secured. Directions are given for the manufacture of cheese from goat's milk. Results secured in a cooperative experiment by the Sea View Hospital, New York, and the Bureau of Animal Industry upon the value of goat's milk for tuberculous patients were entirely negative.

The essentials of a goat dairy are noted, and the floor plans and details are given of the goat dairy at the department experiment farm at Beltsville, Md. Breeding experiments at this farm have involved the crossing of pure-bred Saanen and Toggenburg bucks on common American does. The crossbred goats from each of these breeds have shown great improvement over the common goat. The grade Saanen does have had a lactation period of from 7 to 10 months and have given an average of 3.1 lbs. of milk per day, ranging in fat content from 4 to 6 per cent. The grade Toggenburg does have milked from 6 to 10 months and produced an average of 3.2 lbs. of milk per day, the fat content of which ranged from 4 to 6 per cent. The average weight of the mature half-Saanen does in 1917 was 129 lbs., and of the half-Toggenburg does 103 lbs. In 1915 the average daily milk yield per head of 10 selected common does was 1.5 lbs. for periods of from 7 to 10 months. This milk ranged in fat content from 6.5 to 9.4 per cent.

The Bureau herd of does in milk are fed in winter a ration of 2 lbs. of alfalfa or clover hay, 1.5 lbs. of silage or turnips, and from 1 to 2 lbs. of a grain mixture of corn, oats, bran, and linseed meal (10:10:5:1). On pasture the does are fed from 1 to 1.5 lbs. of a grain mixture of corn, oats, and bran (2:2:1). In 1916 the herd of 10 grade Toggenburg and Saanen does during their lactation period required 1.21 lbs. of grain to produce a quart of milk.

The milch goat, A. C. McCandlish and L. S. Gillette (*Iowa Sta. Circ. 42 (1918), pp. 4*).—Brief notes are given on the adaptations, breeds, feeding, management, and product of milch goats.

Germ content of milk.—II, As influenced by the utensils, M. J. Prucha, H. M. Weeter, and W. H. Chambers (*Illinois Sta. Bul. 204 (1918), pp. 217–257, fig. 1*).—In continuation of the study of the relative importance of the various channels through which bacteria enter milk (E. S. R., 37, p. 684), results are here given of investigations begun in 1913 upon the influence that the various utensils in which milk is normally handled exert upon the germ content of the milk. In part 1 of the bulletin are reported the results of experiments in which the influence was studied by direct examination of the cans and bottles. The aim of these tests was to determine the number of bacteria in freshly washed unsteamed cans and bottles, whether bacteria increased in washed utensils before being filled, and the source of these bacteria.

The study of bacteria in freshly washed cans was made with 170 cans that had been used in shipping sweet milk from 37 farms to two dairies. In dairy A the milk handled in the cans had a low germ content. The number of cans washed in the same lot of wash water was from 20 to 30, and the amount of

wash water used was 60 gal., the cans being rinsed after washing. In dairy B the milk had a high germ content. From 60 to 80 cans were washed in the same lot of wash water, the amount of water being about 25 gal., and the cans were not rinsed after they were washed. The cans were washed immediately after the milk was poured from them, and the plating of the rinse water was made in from one-half to four hours.

More than 1,000,000,000 bacteria were removed from each of 39 of the cans washed in dairy A, and from each of 38 others the number was more than 100,000,000. Even larger numbers were removed from the 56 cans washed in dairy B. In only 4 of the cans in this dairy was the number smaller than 100,000,000. Had these 170 freshly washed cans been filled with sterile milk the resulting germ content would have varied from 197 to 2,557,000 per cubic centimeter. The results of successive rinsings with sterile water indicate that, while a considerable fraction of the germ life in the cans was removed by the first rinsing, it is by no means the entire germ life present.

Fifty cans washed, steamed, and left 30 hours uncovered and inverted on a rack, if filled with milk would have added to the milk an average of 8 bacteria per cubic centimeter. Fifty cans similarly cleansed but left 30 hours with the lids on, if filled with milk would have added to the milk an average of 1,816 bacteria per cubic centimeter. Fifty cans washed but not steamed and held 30 hours uncovered and inverted on a rack, if filled with milk would have added to the milk an average of 27,164 bacteria per cubic centimeter. Ten cans similarly cleansed, but held 30 hours with the lids on, if filled with milk would have added to the milk an average of 128,730 bacteria per cubic centimeter. Ninety-one milk cans that had been washed, rinsed, and steamed at the dairy and covered with their lids, examined as they were about to be used on several dairy farms showed that had they been filled with milk they would have added to the milk an average of 23,523 bacteria per cubic centimeter. The treatment of these cans at the farms was not uniform, either as to their being kept covered or as to the length of time elapsing before their use.

A comparison of the germ content of each of 153 milk cans after the cans had been emptied and washed, but not rinsed or steamed, and the germ content of the milk previously held by the cans, in most cases revealed no direct relationship. However, taken as a whole, the dairy which received the milk with the higher germ content also had the cans with the higher germ content.

An examination of 134 freshly washed cans and of the water in which they were washed showed that the wash water became heavily seeded with bacteria during the washing process. However, the extremely large numbers of bacteria found in some of the washed cans could not be accounted for by contamination from the wash water.

Bacterial counts were made of a number of washed but unsteamed milk bottles. The results show that if these bottles had been filled with milk the germ content of the milk would have been increased by an average of 1,339 bacteria per cubic centimeter by the freshly washed bottles and 12,930 bacteria per cubic centimeter by the bottles held 24 hours after washing.

The experiments reported in part 2 were designed to test the influence of the various unsteamed utensils upon the germ content in actual dairy operations, as shown by the difference in the germ content of the milk handled in steamed and in unsteamed utensils. The steaming consisted in holding the utensils in a chamber filled with flowing steam for about an hour, except that some of the pails and cans were held over a steam jet for two to three minutes. Bacterial examination of the utensils showed that this steaming was satisfactory.

An examination of 81 cans of milk at the farm ready for transportation to the dairy, when all utensils had been carefully steamed, showed an average germ content of 6,807 bacteria per cubic centimeter. A similar examination of the milk in 117 cans from the same farms, when all utensils were similarly treated, except that the steaming was omitted, showed an average germ content of 285,600 bacteria per cubic centimeter.

When the bottle filler was carefully washed and steamed it exerted no appreciable effect upon the germ content of the milk passing through it. When it was similarly washed, but not steamed, the germ content of the milk of the first bottle was increased on the average by 96,900 bacteria per cubic centimeter. The continued use of the bottle filler gradually washed the larger part of the germ life from the machine.

A study of the collective influence of all the utensils that normally come into contact with the milk, both at the barn and at the dairy, showed that when all the utensils were carefully steamed the germ content of the milk in the bottles was about 4,566 bacteria per cubic centimeter. When similar conditions obtained, except that the steaming of the utensils was omitted, the germ content of the milk approximated 257,240 bacteria per cubic centimeter.

Of all the various utensils coming into contact with the milk at the barn and at the dairy, the clarifier and the bottle filler when unsteamed proved to be the most prolific sources of contamination. The clarifier added an average of 141,340 bacteria per cubic centimeter to the milk passed through it, while the bottle-filler tank and the four valves of the filler added appproximately 436,000 bacteria per cubic centimeter to the same milk.

Factors of importance in producing milk of low bacterial count, C. L. Roadhouse (*California Sta. Circ. 179 (1917), pp. 11, figs. 6*).—This circular points out briefly the principal sources of microorganisms in milk, and explains how the care of milk leads to a lower bacterial content. Specifications are given for the construction of an inexpensive combination hot-water heater and steam sterilizer for dairy utensils.

The pasteurization of sour, farm-skimmed cream for butter making, O. F. Hunziker, G. Spitzer, H. C. Mills, H. B. Switzer, et al. (*Indiana Sta. Bul. 208 (1917), pp. 3–76*).—The experiments here reported were undertaken to determine (1) the effect of pasteurization of sour, farm-separator cream on the flavor, keeping quality, and market value of butter; (2) the effect of different processes of pasteurization on the bacterial count of cream and butter and on the flavor and keeping quality of butter; (3) the effect of pasteurization on the chemical properties of fresh and stored butter; (4) the causes underlying the changes in the flavor of raw and pasteurized cream butter in storage.

In each set of experiments about 1,600 lbs. of 30 to 40 per cent cream of 0.3 to 0.7 per cent acidity was used. This cream was divided into four churnings, as follows: (1) Churned raw; (2) pasteurized at 145° F., holding for 20 minutes; (3) pasteurized at 165° flash process; (4) pasteurized at 185° flash process. Five-lb. cartons of the butter were held in cold storage at from 0 to 20°, and were scored when fresh and when 30, 60, and 90 days old. The average scores of 204 churnings indicate that the butter from the raw cream possessed the poorest keeping quality, scoring 3.03 points lower when fresh and 4.51 points lower when 90 days old than the butter from cream pasteurized at 145° holding process, which scored highest when fresh and after storage. Butter from cream pasteurized at 165 and 185° flash process had a pronounced oily flavor. The flavor largely disappeared in storage, but flavors characteristic of storage butter developed.

On the basis of market conditions at the time of this study, the butter from the pasteurized cream, averaged, after 30 days' storage, from 0.8 to 0.9 ct., in

the case of the flash process, to 1.7 cts., in the case of the holding process, higher in price than the butter made from raw cream.

The holding process of pasteurization at 145° was most efficient, averaging over 99.9 per cent in its germ-killing effect on all types of microorganisms. The flash process at 185° lacked uniformity, and at 165° was deficient in germ-killing efficiency. The germ-killing efficiency of pasteurization in summer was greater and the keeping quality of such butter was better than that of winter cream and butter. However, pasteurization at 145° holding process destroyed over 99 per cent of the germ content of cream, regardless of the season of the year and variations in the resistance of different types of germs.

In order to test the effect of time of holding cream at 145° on the germ-killing efficiency and on the keeping quality of butter, cream was held at this temperature for 10, 15, 20, 30, and 40 minutes. From the standpoint of the keeping quality of the butter 20 minutes' holding proved best. The greatest reduction of microorganisms occurred when the cream was held at 145° for 40 minutes, and the germ-killing efficiency was greatly diminished when the time of exposure was shortened to 15 or 10 minutes. Butter from cream held at 145° for more than 20 minutes, however, contained as large numbers of liquefiers, yeasts, and molds as when held for 20 minutes only, and exposure at 145° for longer than 20 minutes was found to produce a mealy body in the butter under certain conditions.

Another experiment demonstrated the necessity of guarding against recontamination after pasteurization. It has been found that an unclean vat may reduce the efficiency of pasteurization 50 per cent. It was also shown that the better the flavor and the lower the acidity of the cream at the time of pasteurization, the better will be the flavor of the butter when fresh and when it comes out of storage.

In 104 churnings the average percentages of fat in the buttermilk were as follows: From raw cream 0.101, and from pasteurized cream at 145° held 20 minutes 0.137, at 165° flash 0.12, and at 185° flash 0.12. In these churnings there was a somewhat larger loss of fat from the high-acid cream than from the low-acid cream.

Pasteurization of cream had very little effect on the chemical composition of the butter. The moisture, curd, and acid were somewhat lower in the pasteurized cream butter than in the raw cream butter, and the highest temperature used for pasteurizing showed the greatest difference. There was a gradual decrease in lactose and increase in acidity of the raw and pasteurized cream butter after three months' storage; however, the raw cream butter increased far more rapidly in acidity than the pasteurized cream butter. There was also a decrease in the acidity of the fresh butter, due to pasteurization. The fat constants in butter in storage were found to undergo but very slight changes, and these changes averaged somewhat greater in raw cream butter than in pasteurized cream butter. Results of monthly analyses of milk fat held for one year at ordinary room temperature show that the fat constants in the stored fat underwent very slight changes, not at all commensurate with the degree of rancidity and tallowiness developed in the fat.

The hydrolyzed or cleavage products of the proteins in butter were determined in 64 separate churnings of the butter from raw and pasteurized cream, when the butter was fresh, and after storage at —6° for one, three, and five months, respectively. The results indicate that some protein decomposition takes place in all butter during storage even at a temperature below 0°, and it is suggested that this protein hydrolysis may, in a large measure, be responsible for off flavors in storage butter. Butter that is intended for prolonged storage should, therefore, be as free as possible from curd. It is also

noted that the protein hydrolysis was greatest in the raw cream butter and least in butter made from cream pasteurized at 185° flash process. The protein cleavage was greatly increased after butter had been transferred from cold-storage to room temperature.

The causes of protein hydrolysis are discussed, and the methods used in these experimental analyses of the cream and butter are outlined. Detailed tabular data brought out in the study are appended.

Errors in the weight of print butter: Their causes and prevention, H. RUNKEL and H. M. ROESER (*U. S. Dept. Agr., Office Sec. Circ. 95 (1918), pp. 14, figs. 7*).—This circular, which is based upon studies by the Bureau of Chemistry in cooperation with the Division of Weights and Measures of the Bureau of Standards, is issued to show the responsibility of butter makers in complying with the requirements of the Federal net weight law and to suggest a procedure to reduce the inaccuracy and lack of uniformity in present methods of printing butter.

The average difference between the heaviest and lightest of 50 1-lb. prints selected at random in about 250 plants was 0.56 oz. The types of errors made by manufacturers may be due to (1) the difference of single prints from 16 oz. and (2) the difference of the average weight from 16 oz. Errors on single prints, when the average is correct, are due principally to the physical condition of the butter, the inaccuracy of the printing machine, and the carelessness of the operator. These errors may be largely eliminated by attention to such details as uniformity of mixing, control of the temperature at which printed, securing a uniform solidity of the print, cutting all prints squarely, filling out the corners, preventing air holes in the middle of the print, elimination of worn utensils, and keeping cutting wires tight and the proper distance apart.

Errors on the average weight are due largely to inaccurate scales and incorrect methods of adjusting the machine. They may be largely eliminated by first securing an accurate scale and then looking carefully to its preservation; also, by weighing at least 5 per cent of all prints in groups of five or ten at frequent intervals during each churning in order to check up the printing machine.

Actual conditions as they were found in the field are discussed and the relation of the different sources of error to one another is pointed out.

VETERINARY MEDICINE.

Preventive medicine and hygiene, M. J. ROSENAU (*New York and London: D. Appleton & Co., 1917, 3. ed., enl., pp. XXXVI+1374, pl. 1, figs. 206*).—This new edition is called by the author a "special" or "military" edition, inasmuch as it contains a discussion of the "duties and organization of the Sanitary Corps, the examination of recruits, diseases of the soldier, sanitation of troops in camp and on the march, sanitation of barracks and trenches, physical training, personal hygiene and equipment of the soldier, Red Cross, rations, etc., . . . and the 'new' diseases and new medical conditions which have arisen in the present world war, such as trench fever, trench foot, war nephritis, shell shock, gas poisoning, tuberculosis, venereal diseases, etc." The book contains chapters on Sewage and Garbage, by G. C. Whipple; Vital Statistics, by J. W. Trask; and Mental Hygiene, by T. W. Salmon.

Report of veterinarian, C. A. CARY (*Alabama Col. Sta. Rpt. 1917, pp. 25–27*).—Work with the kidney worm (*Stephanurus dentatus*) has shown that its eggs pass out from the body of its host in the urine and hatch at ordinary temperatures in about 17 days in urine, water, and moist soil. Its eggs were found in the urine in the bladder of a number of pigs,

Tests made of the action of "bitterweed" (*Helenium tenuifolium*) indicate that it is toxic for horses, mules, and dogs, but not so for cattle. A collection of 180 tabanids was made during the fall.

A series of tests made to determine the toxic action of *Eupatorium ageratoides* indicate that it produces progressive degenerative change in the red blood cells, polymorphonuclear cells, and eosinophils. In the cat, dog, and goat it failed to produce any symptoms resembling "trembles."

White snakeroot or richweed (Eupatorium urticæfolium) as a stock-poisoning plant, C. D. Marsh and A. B. Clawson (*U. S. Dept. Agr., Bur. Anim. Indus., 1918, pp. 7, fig. 1*).—This is a popular summary of information, based upon the investigations previously noted (E. S. R., 38, p. 685), in which it is pointed out that the losses of live stock from poisoning by this plant should be avoided by prevention rather than by reliance upon remedies. Since it takes a fairly large quantity to poison an animal, little harm will result from eating the plant for a short time unless the animal is unusually hungry.

Efficacy of some anthelmintics, M. C. Hall and W. D. Foster (*U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 7, pp. 397–447, fig. 1*).—In carrying out the series of experiments here reported the plan of the authors was to test as many drugs as possible having a known or alleged anthelmintic value, making further experiments with the more promising. The animals were given an appropriate dose of the anthelmintic to be tested. The treatment was usually administered in the morning and all feces were collected and examined every morning thereafter until the animal was killed, which was usually the morning of the fourth day after the administration of the last dose of the anthelmintic, and all parasites remaining were collected and counted.

The experimental data presented are arranged in three groups, (1) simple purgatives, (2) a group including anthelmintics having a mineral base and coal-tar products, and (3) a group covering the vegetable anthelmintics. The conclusions drawn by the authors from the results of the investigations reported are as follows:

"Simple purgatives, calomel and castor oil, may have some slight value as anthelmintics, but it is hardly sufficient to justify their use for this purpose. Ascarids in dogs are sometimes removed by castor oil given as a preliminary purge, and this fact may prove of benefit in veterinary practice as a diagnostic measure when the more accurate method of microscopic fecal examination can not be carried out. However, castor oil failed to remove ascarids more frequently than it succeeded, and in no case were all the ascarids removed from any one animal. As many of the experiments on dogs were preceded by a dose of castor oil, the writers have fairly extensive data on this subject.

"The most reliable vermifuge for ascarids, whether in dogs or swine, is oil of chenopodium. This drug, which was tested out on 34 dogs in six experiments, showed an efficacy for the entire series of 97 per cent. It rarely fails to remove all the ascarids present in a dog if given at the rate of 0.2 mil per kilogram, preceded by a dose of castor oil and the animal starved for 24 hours before treatment. The chenopodium treatment is also very efficacious for ascarids in swine and when properly administered may be expected to remove most, if not all, of the worms present. It would seem, however, that neither chenopodium nor any other drug tested will give satisfactory results if mixed with the daily ration and the animals allowed to dose themselves; it is best given to each pig individually in suitable dosage, preceded by a fast. While this method necessarily involves considerable labor when treating animals as unruly as swine, the labor can be reduced by sorting the hogs roughly into classes according to size and confining them in inclosures which will permit them to be caught with

a minimum amount of struggling. The treatment has proved practical on a large scale and the results, as far as they could be determined, were entirely satisfactory. Oil of chenopodium appeared to be effective for stomach worms in sheep, although the data on this subject are not sufficient to warrant its recommendation. It is also of some efficacy for hookworms in sheep and in dogs, though in the latter case chloroform was found more reliable.

"Other remedies which seem to have more or less merit as anthelmintics against ascarids are the latex of *Ficus laurifolia*, santonin in repeated doses, and thymol. Although thymol in repeated doses is fairly efficacious against hookworms, it was inferior to chloroform for this purpose, causing more distress. An excellent preparation for mixed infestation in dogs consists of equal parts of oil of chenopodium and chloroform, given at the rate of 0.2 mil per kilogram, combined with 30 mils of castor oil. This preparation may be expected to remove all the ascarids present, a large proportion of hookworms, and possibly a certain percentage of whipworms. This latter parasite seems to be very difficult to eliminate, and nothing tried by the writers proved very efficacious, almost any anthelmintic occasionally proving successful. This experience may perhaps be explained by an intermittent peristalsis of the cecum, which occasionally allows the anthelmintic to enter, but which usually excludes it. Although chloroform was fairly successful in removing stomach worms from sheep, both animals upon which it was tried subsequently died from its effects, and it would seem to be too dangerous for use on sheep.

"In the case of stomach worms in sheep, copper sulphate was found to be the most satisfactory remedy, the experiments confirming the findings of Hutcheon. A simple apparatus devised by the senior writer reduces the labor involved in drenching a flock of sheep and insures accurate dosage. Petroleum benzin also proved satisfactory and was more efficacious for hookworms than copper sulphate. However, it is much more expensive than copper-sulphate solution, must be given three times and in a vehicle like milk, which adds greatly to the expense. The fact that petroleum benzin (refined gasoline) proved efficacious, while commercial gasoline was considerably less so, is perhaps related to the differences in specific gravity and consequent volatility of the refined product compared with the commercial product.

"Among anthelmintics intended for use against tapeworms, male-fern proved efficacious when tested on dogs. In the case of cats it removed all tapeworms from 75 per cent of the animals tested, though it proved fatal to two out of six animals which were somewhat enfeebled from disease. Apparently it is more toxic to cats than dogs and should be prescribed with caution and only given to healthy subjects. So far as can be judged from a single experiment with dogs, there seems to be no danger in combining male-fern with castor oil, as is done in the so-called Hermann's mixture. In fact, the writers are inclined to agree with Seifert (1908) that the administration of castor oil after male-fern will avoid the toxic effects of the latter by causing its rapid and thorough elimination, and that for this purpose no other purgative is quite so effective. This subject, however, should receive more study before conclusions are drawn.

"Pelletierine tannate was a failure in the one experiment in which it was tested on cats but was efficacious on dogs. No remedy was efficacious against tapeworms in poultry. Of the four drugs tested, chenopodium gave the best results for this purpose, but its efficacy for tapeworms is very slight.

"Turpentine proved the most efficacious of the remedies tested on poultry for the removal of *Ascaridia perspicillum*, while chenopodium was nearly as good. When tested on dogs and pigs, turpentine was not very efficacious; and,

as it caused grave symptoms of nephritis in pigs and caused the death of some of the experiment dogs, its use upon these animals is inadvisable.

"The treatment with chopped tobacco stems recommended by Herms and Beach for ascarids in poultry proved fairly efficacious for *Heterakis papillosa* and would presumably be at least as efficacious for *A. perspicillum*, since this latter worm is more easily reached by anthelmintics than is *H. papillosa*.

"There are a large number of drugs showing a greater or less degree of efficacy for the various intestinal parasites of domestic animals. Usually their action is selective—that is, they show a pronounced efficacy for certain species of intestinal worms, while they are decidedly less efficacious or entirely inefficacious against other intestinal parasites. If we consider the ideal anthelmintic one which will remove all worms of a given class or species, and do this every time in a single dose, we find that very few drugs approach this ideal.

"Among the drugs which have given the best results under experimental conditions for the purposes intended and concerning which the writers have sufficient data to warrant positive conclusions may be mentioned the following: (1) Copper sulphate in drench for stomach worms in sheep; (2) oil of chenopodium for ascarids in pigs and dogs; (3) oleoresin of male-fern for tapeworms in dogs; (4) turpentine for *A. perspicillum* in fowls; and (5) chopped tobacco stems for *H. papillosa* in fowls."

The treatment of severe burns with ambrine, C. G. McMullen (*Gen. Elect. Rev., 20* (*1918*), *No. 9, pp. 717–722, figs. 6; Sci. Amer. Sup., 85* (*1918*), *No. 2203, pp. 190, 191*).—This article describes the use of ambrine in severe burns and gives a résumé of the literature on the subject.

Bacteria in dust, E. Burnet (*Ann. Inst. Pasteur, 31* (*1917*), *No. 12, pp. 593–600*).—In bacterial examinations of samples of fresh street dust, 3 out of 18 samples contained the tubercle bacillus. Dried dust obtained from vacuum cleaners in theaters, stores, etc., gave evidence at first of very few organisms, but with proper cultivation under anaerobic conditions it was found to contain, in addition to *Bacillus subtilis* and various representatives of the mesentericus group, putrefying organisms such as *B. welchii, B. tetanus*, and *B. sporogenes*.

The author suggests the possibility that certain cases of tetanus, the origin of which is obscure, may be caused by the tetanus spores penetrating into the body with very fine dust.

The action of cold on microorganisms, A. Q. Ruata (*Ann. Ig.* [*Rome*], *28* (*1918*), *No. 1, pp. 1–10*).—The purpose of the studies reported was to determine whether microorganisms are actually destroyed by cold or whether they are simply rendered inert during the time in which they are kept at low temperature. Various organisms in gelatin culture were kept for from 1 to 24 days at a temperature of from —3 to —12° C. in a dry atmosphere. Each day a small portion of the gelatin culture was removed from the refrigerator and placed in an incubator at 22° for 10 days, at the end of which time the colonies in the various tests and in the control were counted. The biological properties of the organisms studied were tested in various ways. Studies were made on *Bacillus coli, B. pyocyaneus, B. proteus vulgaris, B. bulgaricus, B. clavatus*, and other putrefying organisms.

The results show that the prolonged action of cold produces not only a paralyzing effect upon microorganisms but progressively destroys them. The spores of *B. clavatus*, although more resistant than the bacillus itself, were gradually killed under prolonged action of cold. The bacteriological properties of the organisms studied showed progressive changes in accordance with the gradual destruction of the organism.

The author concludes that a practical application of the results obtained could be made in the preserving industry in the sterilization of various fresh foods.

The value of Wulff's method for the diagnosis of anthrax, L. Sani (*Clin. Vet.* [*Milan*], *Rass. Pol. Sanit. e Ig.*, *41* (*1918*), *No. 1-2*, *pp. 4-10*).—The diagnosis of anthrax with the aid of bone marrow as described by Wulff (E. S. R., 27, p. 781) is considered by the author, after experimental work, to be preferable to all other methods, particularly where the diagnosis has to be made on carcasses which have undergone extensive putrefaction. The compactness and chemical composition of the bones are such as to offer greater resistance to putrefactive action and a favorable place for the development and preservation of the anthrax bacillus.

Studies on diphtheria toxin.—I, Hydrogen-ion concentration and toxicogenicity determinations with Bacterium diphtheriæ, L. Davis (*Jour. Lab. and Clin. Med.*, *3* (*1918*), *No. 6*, *pp. 358-367*, *figs. 2*).—The purpose of the present investigation was to determine by means of the hydrogen electrode the reaction changes which take place in the medium during the formation of diphtheria toxin on a practical scale, and to note the relationship between toxicogenicity and hydrogen-ion concentration. The medium used for the study was plain bouillon made by adding 20 gm. of peptone and 5 gm. of sodium chlorid to every liter of beef infusion prepared in the usual way. Adjustment to the desired hydrogen-ion concentration was made by the method of Clark and Lubs (E. S. R., 37, p. 506). The experimental data led to the following conclusions:

"Toxin of maximum potency is produced in bouillon by *B. diptheriæ* only when the initial reaction falls within a certain zone of alkalinity, included within the hydrogen-ion concentration limits of about 7×10^{-8} to about 5×10^{-9}. Luxuriant growth of the organism appears to be possible where the reaction of the bouillon ranges from about $C_{\overset{+}{H}}=1\times10^{-6}$ to about $C_{\overset{+}{H}}=8.4\times10^{-10}$. When cultivated in plain bouillon under optimal conditions, *B. diphtheriæ* undergoes an initial increase in hydrogen-ion concentration. This is soon followed by a steady decrease until apparently a limiting alkaline reaction is attained. The total acid produced is relatively small and seems to vary in amount with each individual strain. Toxicogenic strains appeared to develop more acid than an avirulent strain. The initial increase in hydrogen ions is due to fermentation of some constituent in both peptone and beef infusion. No direct relationship can be found between the hydrogen-ion concentration of the medium and toxicity during the growth of *B. diphtheriæ*."

The intrapalpebral mallein reaction, A. Lanfranchi (*Mod. Zooiatro, Parte Sci.*, *28* (*1917*), *No. 9*, *pp. 197-202*, *fig. 1*; *abs. in Rev. Gén. Méd. Vét.*, *27* (*1918*), *No. 314*, *p. 86*).—The author states that in cases where the intrapalpebral mallein reaction, previously noted (E. S. R., 32, p. 374), produces either through successive injections or other causes sclerosis of the connective tissue, the injection of mallein may be made in the upper instead of the lower eyelid. In case of a negative reaction at least 15 days should elapse before repeating the injection.

The intrapalpebral reaction in the diagnosis of epizootic lymphangitis, A. Lanfranchi (*Mod. Zooiatro, Parte Sci.*, *28* (*1917*), *No. 10*, *pp. 217-225*, *figs. 5*; *abs. in Rev. Gén. Méd. Vét.*, *27* (*1918*), *No. 314*, *pp. 80, 81*).—The intrapalpebral reaction employed in the diagnosis of glanders, previously noted (E. S. R., 32, p. 374), has been successfully applied for the diagnosis of epizootic lymphangitis. The material for the test, taken aseptically from mature lesions rich in cryptococci, is attenuated by shaking in ether for about 24 hours, evaporating the ether, and heating the mixture for from 15 to 20 min-

utes in a water bath at 80° C. It is then centrifuged for 20 to 30 minutes, and the clear liquid is ready for injection in doses of from 2.5 to 3 cc., according to the technique employed for the mallein reaction.

Pyotherapy in epizootic lymphangitis, A. Lanfranchi and P. Bardelli (*Mod. Zooiatro, Parte Sci., 28 (1917), No. 12, pp. 261–275, figs. 9*).—The author reviews the literature on the treatment of epizootic lymphangitis by pyotherapy and reports unsuccessful results of using this method in cases of light, moderately severe, and severe lesions. He concludes that pyotherapy or autopyotherapy does not represent a method for the definite cure of epizootic lymphangitis.

A study of hemorrhagic septicemia: Observations in sheep and in mouflon-sheep hybrids, N. Mori (*R. Ist. Incoragg. Napoli, Ann. Staz. Sper. Malattie Infett. Bestiame, 3 (1916), No. 2, pp. 3–35; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 7, pp. 1010–1012; Abs. Bact., 1 (1917), No. 6, p. 529*).—A short history of the disease as reported by various investigators is given followed by a detailed study of it as observed in material from the Naples Veterinary School and other districts of southern Italy. The symptoms and anatomical lesions in subacute and chronic forms of the disease are described.

The organism *Bacillus ovisepticus*, responsible for the disease, is polymorphous, Gram-negative, nonmotile, nonspore-forming, and aerobic. Immune serum prepared with it agglutinates the strains of hemorrhagic septicemia of other animal species, thus justifying the interpretation that the various strains are races of a single organism derived through acclimatization in organisms of another species. For the treatment of the disease the author refers to the serum vaccine treatment of Raebiger (E. S. R., 35, p. 77) and others.

A bibliography of 14 titles is appended.

The enzyms of the tubercle bacillus, H. J. Corper and H. C. Sweany (*Jour. Bact., 3 (1918), No. 2, pp. 129–151, figs. 3*).—Studies on the autolysis of tubercle bacilli, previously noted (E. S. R., 36, p. 181), were continued by the determination of autolysis of bovine tubercle bacilli and a determination of the α-amino nitrogen in the autolysate. It was found that "tubercle bacilli of both the human and bovine varieties possess autolytic enzyms, as indicated by the non-coagulable nitrogen and α-amino acid nitrogen liberated at incubator temperature after the bacilli have been killed by toluene and chloroform."

The presence of individual enzyms in the tubercle bacillus was determined by the nephelometric method of Kober and Graves (E. S. R., 32, p. 310) and by examining the autolysate for the various products of enzym action. It was found that "the bacilli themselves, or autolysates therefrom, also possess a trypsin-like enzym capable of splitting proteins in alkaline solution, an erepsin-like enzym capable of decomposing peptone in acid solution, a weak pepsin-like enzym capable of splitting proteins in acid solution, a nuclease capable of splitting nucleic acid, and a urease capable of decomposing urea.

"The tubercle bacilli, or autolysates therefrom, do not possess enzyms capable of hydrolyzing starch or inverting sucrose, demonstrable by the delicate Lewis and Benedict picramic acid method. Autolysates from tubercle bacilli do not possess enzyms capable of digesting elastic tissue prepared from lamb lung, or connective tissue prepared from tubercles, at least as indicated by the methods used for demonstrating these enzyms."

Bovine tuberculosis: Its diagnosis and control, V. A. Moore (*Amer. Jour. Vet. Med., 13 (1918), No. 4, pp. 167–172*).—This article gives a historical survey of bovine tuberculosis and the measures taken in different countries for its control, a description of the nature and distribution of the lesions of the disease,

and a discussion of the tuberculin reaction. An inquiry into the cases where tuberculin has failed to produce a reaction on tuberculous animals has shown that the failure may be attributed to one or more of the following causes: (1) The use of strains of tubercle bacilli which do not make an efficient tuberculin, (2) the use of cultures of the bacilli which are not properly grown and do not contain a sufficient quantity of the specific protein to enable it to cause a reaction, (3) the interpretation of the manifestations following the use of tuberculin not made in accordance with the laws governing the reaction between it and the products of tuberculous lesions in the living animals, (4) the application of tuberculin in the period of incubation, (5) the tuberculous lesions being arrested, healed, encapsulated, or very extensive, and (6) repeated administrations of tuberculin resulting in the failure of the reaction after one or more injections. In the opinion of the author subcutaneous injection has been more satisfactory than other methods of administering tuberculin.

The biological behavior of Piroplasma bigeminum in cows in Eritrea.—The variety acquired in the practice of serum vaccination against rinderpest, G. Di Domizio (*Mod. Zooiatro, Parte Sci., 28 (1917), Nos. 10, pp. 232–236, fig. 1; 11, pp. 247–259*).—*P. bigeminum* in Eritrea is so widespread that practically all cows are afflicted with it at some period of their lives. As a latent infection it may not be detected by itself either clinically or microscopically, but it is very easily detected in connection with rinderpest. An animal whose resistance is weakened by rinderpest is more susceptible to *P. bigeminum*, which is often present in the blood used for inoculation against rinderpest. For this reason the author recommends that in serum vaccination against rinderpest in Eritrea great care should be taken regarding the purity of the serum in order to have it as free as possible from the Piroplasma. This can best be accomplished by taking the serum on the fourth or fifth day of the disease at which time the symptoms of rinderpest alone are present, the circulating blood containing active rinderpest virus but with no Piroplasma or in such small quantities that it can not be detected in microscopic examination. The serum should not be taken on the sixth or seventh day of the illness, because the virulence of the virus is more attenuated and because the *P. bigeminum* is probably present in greater numbers and in a more virulent form.

A bacteriological report in regard to hog cholera, G. F. Gardenghi (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig., 41 (1918), No. 4, pp. 84–88*).—A typical case of hog cholera is reported with post-mortem findings and a bacteriological study of the filterable virus obtained from the animal.

The results led to the conclusion that the Voldagsen strain of paratyphoid B can be found associated with filterable virus in hog cholera.

Fundamental principles governing the control of hog cholera, D. F. Luckey (*Amer. Jour. Vet. Med., 13 (1918), No. 4, pp. 157–160, 200*).—The principles discussed are more thorough and efficient organization, attention to the sources of infection, more stringent quarantine regulations, and laws forbidding the sale of hogs affected with any disease and prohibiting vaccination except by graduate veterinarians.

Statistics on the use of hog cholera antiserum and hog cholera virus, C. G. Cole (*Amer. Jour. Vet. Med., 13 (1918), No. 4, pp. 173, 174*).—During the year 1917, 16.7 per cent of all the hogs in Iowa were immunized. The average percentage of losses from the use of the simultaneous method in healthy herds over a period of five years was 2.1, the loss in 1917 being only 0.7 per cent. A report on 264,367 hogs, consisting of 92,943 sick or exposed and 171,424 healthy hogs, shows a loss of 2.1 per cent of healthy and 15.5 per cent of sick hogs. Of the hogs actually sick when treated, a recovery of 34.1 per cent is shown by the use of the serum-alone method against 29 per cent by the use of the

simultaneous method. The serum-alone treatment thus seems to be more successful in the case of sick hogs, although the simultaneous method is superior from the standpoint of immunizing hogs.

Ulcerous lymphangitis in horses (*Clin. Vet.* [*Milan*], *Rass. Pol. Sanit. e Ig.*, *41* (*1918*), *No. 1–2*, *pp. 11–19*, *pl. 1*).—In this article are summarized the clinical forms and symptoms of ulcerous lymphangitis caused by the Preisz-Nocard bacillus, the evolution and differential diagnosis of the disease, and its prophylactic and therapeutic treatment.

Infections caused by Bacterium pullorum in adult fowls, P. [B]. Hadley et al. (*Rhode Island Sta. Bul. 172* (*1917*), *pp. 3–40*).—This bulletin reports the results of a study in which it was established that *Bacterium pullorum* was the causative agent in an epidemic in adult fowls indistinguishable in its clinical picture and pathological manifestations from fowl typhoid.

"The primary observations and the experimental features of the study lead to the conclusion that latent *B. pullorum* infection was stimulated into active manifestations of fatal generalized infection as a result of intestinal irritation, or other physiological changes, following the feeding of a ration containing a large proportion of roughage in the form of oat husks. The author points to the need of regarding more seriously the endogenous as opposed to the exogenous origin of 'epidemic' diseases among poultry. Among possible endogenous disease-stimuli the importance of a hygienic feeding regime is especially emphasized.

"The existence of intermediate bacterial forms, resembling *B. pullorum*, but varying slightly toward *B. gallinarum* Klein is suggested, and it is proposed to make use of the terms *B. pullorum* A and *B. pullorum* B in order to keep these types distinct pending their further study. It is further suggested that *B. pullorum* appears to stand as a border line group in the colon-typhoid intermediates, separating the actual paratyphoids (*B. gallinarum*, etc.) from the actual paracolons (*B. suipestifer*, *B. paratyphosus* A and B, etc.). It is recommended that, in order to facilitate bringing about some degree of order in the group of 'colon-typhoid intermediates,' gas-forming strains be referred to the paracolon group, which should be revived; and that anærogenic forms only should be referred to the paratyphoid group, in which *B. gallinarum* might stand as the type species."

The author reports that he has data on three epidemics in adult stock due to the agency of *B. pullorum*. These epidemics, two of which were somewhat extensive, occurred in widely separated parts of the country. In all three bacteria of the fowl typhoid type (*B. gallinarum*) were absent, yet the clinical picture and the pathological manifestations were those of fowl typhoid.

A list of 13 references to the literature is given.

A study of the etiology of roup in birds, J. G. Jackley (*Kansas Sta. Tech. Bul. 4* (*1917*), *pp. 5–23*).—A summary of inquiries pertaining to poultry diseases at the station gave the following approximate percentage relationship of the various poultry diseases in Kansas: Roup 70 per cent, cholera 15 per cent, white diarrhea 9 per cent, blackhead 1 per cent, and other troubles, including mites, lice, worms, etc., 5 per cent. Losses to the industry from roup vary with different seasons, occasional outbreaks showing a mortality of from 50 to 100 per cent, while in other years only 5 per cent of the flock may be infected with perhaps less than 1 to 2 per cent mortality. Cases that recover from roup are believed to be unprofitable, egg production generally being completely suspended for a time, and the bird seldom fattens and may die later.

In the course of the investigations here reported small Gram-negative, diplococcus-like rods, which did not form spores nor form gas in carbohydrates,

were isolated and apparently deserve recognition as the etiological factor in roup. This organism was recognized in smears from all cases of diphtheria and ocular roup examined. It was grown upon artificial media and the disease again reproduced, and a high degree of protection was shown against the natural disease after immunization with pure cultures. A bibliography is appended.

A further study of the etiology of roup in fowls, J. G. Jackley (*Jour. Amer. Vet. Med. Assoc., 52 (1918), No. 7, pp. 853–858, fig. 1*).—Additional results obtained in the work above noted further support the claim that a bacterium of the Pasteurella group isolated by the author is the etiological factor in roup.

RURAL ENGINEERING.

Surface water supply of North Atlantic slope basins, 1916 (*U. S. Geol. Survey, Water-Supply Paper 431 (1918), pp. 176+XXXVI, pls. 2*).—This report, prepared in cooperation with the States of Maine, Vermont, Massachusetts, and New York, presents the results of measurements of flow made on the St. John, Machias, Union, Penobscot, Kennebec, Androscoggin, Presumpscot, Saco, Merrimac, Blackstone, Connecticut Housatonic, Hudson, Delaware, Susquehanna, Patuxent, Potomac, and Rappahannock River Basins during 1916. Lists of the steam-gauging stations and the publications of the Geological Survey relating to water resources for this region are appended.

Surface water supply of the lower Mississippi River Basin, 1916 (*U. S. Geol. Survey, Water-Supply Paper 437 (1918), pp. 50+XXXII, pls. 2*).—This report presents the results of measurements of flow made on the Arkansas and Red River Basins during 1916. A section on stream-gauging stations and publications relating to water resources is appended.

Surface water supply of Hawaii, 1916 (*U. S. Geol. Survey, Water-Supply Paper 445 (1917), pp. 224*).—This report, prepared in cooperation with the Territory of Hawaii, presents the results of measurements of flow made on certain streams and ditches and rainfall records of the islands of Kauai, Oahu, Maui, and Hawaii for 1916.

Southern California floods of January, 1916, H. D. McGlashan and F. C. Ebert (*U. S. Geol. Survey, Water-Supply Paper 426 (1918), pp. 80, pls. 16, map 1*).—This report, prepared in cooperation with the State of California, presents precipitation records, describes the flood of January, 1916, and reports measurements of flood run-off in the various river basins within the flood area.

Rapid chemical determination of the potability of water, Comte (*Jour. Pharm. et Chim., 7. ser., 14 (1916), No. 5, pp. 135–140; abs. in Chem. Abs., 11 (1917), No. 7, p. 857*).—It was found that, as a result of the examination of more than 250 samples of water in the Argonne region of France, in impure waters the amounts of nitrites in the same specimen may double in 24 hours at laboratory temperature while pure waters show no such variation. The maximum action is reached in 48 hours. Two nitrite determinations are made, one at once and the other on the same sample after 24 hours. By this method even a very slight microbic action may be detected.

"The waters of the Argonne region are graded as follows: Good waters—NaCl, below 12 mg. per liter; NH_3, below 0.05 mg.; oxygen consumption, below 1.2 mg.; nitrites calculated as KNO_2, below 0.03 mg. if there is no variation after 24 hours. Suspected waters—NaCl, 12 to 20 mg.; NH_3, 0.05 to 0.1 mg.; oxygen consumption, 1.2 to 2.5 mg.; nitrites, 0.03 to 0.1 mg.; if the amount varies in the same sample within 24 hours, the limits are 0 to 0.03 mg. Bad waters contain—NaCl, above 20 mg. per liter; NH_3, above 0.1 mg.; oxygen consumption, above 2.5 mg.; nitrites, above 0.1 mg.; if there is appreciable varia-

tion in the same sample in 24 hours, 0.03 mg. of nitrites will be the lower limit for bad water."

The cracking and buckling of cement concrete pavements, H. T. TUTHILL (*Good Roads, n. ser., 14 (1917), No. 20, pp. 255, 256, figs. 4*).—Data on three concrete roads paved with 1:1.5:3 concrete and provided with transverse expansion joints 30 ft. apart are reported. The joint used consisted of a ⅜-in. strip of creosoted yellow pine and the shoulders in all cases were of a sandy loam.

It was found that "in the case of the pavement built with the coarse aggregate of imported crushed stone, there has been no buckling or heaving of the slabs. The pavement developed cracks, but the number of them as compared with the number in the gravel concrete was less, as was also the width of the cracks. No buckling occurred in the pavement built with the deep ditch section, in which the coarse aggregate was gravel. There were numerous cracks, however, running in every direction, those occurring longitudinally of the pavement opening very wide. On the shallow ditch section of the gravel concrete pavement, bad cases of buckling, considerable distances apart, occurred within a week during an extremely hot spell. Longitudinal cracks were also more or less frequent on this section, but there were few diagonal cracks."

Tests show advantages of laying brick directly on concrete base, C. C. WILEY (*Engin. News-Rec., 79 (1917), No. 18, pp. 820–822, figs. 5*).—Tests at the University of Illinois are reported on 66 slabs, including plain concrete slabs indented to represent ordinary concrete roads and monolithic brick slabs (1) consisting of grouted brick only, (2) with a thin layer of mortar used to smooth the surface of the concrete, and (3) with the bricks laid directly on the green concrete. Wire-cut-lug bricks were used in virtually all slabs.

"Comparison of the results given in the accompanying tabulation will show that when the concrete side of the slab is in tension the direction of the brick courses has little effect on the strength, and that the modulus of rupture is approximately that of plain concrete of the same quality. This is true when the concrete forms roughly one-half of the thickness of the slab. With the very thin bases, the brick makes up a sufficient part of the total slab to govern its behavior.

"When the bricks are in tension there is a marked difference in strength with the direction of the courses of brick, as would be expected. Here the slabs with longitudinal courses show high strength, in most instances greater than that of 1:2:3 concrete. This is doubtless due to the fact that the bricks lap in such a way that a shearing stress is set up between the bricks and the grout, and the bond in this direction is sufficient to develop high beam strength. The slabs with transverse joints are very much weaker since in this case the stress is direct tension on the bond between the brick and the grout. The beams with diagonal courses show a strength intermediate between these two. . . .

"Little difference in strength is noted between the 'dry-layer' type and the 'direct-contact' type of construction, and what difference exists is probably due to a difference in the grout. The 'dry-layer' slabs used a grout of ⅛-in. sand, which a few tensile tests showed to yield a stronger grout than the $\frac{1}{16}$-in. sand used in the 'direct-contact' specimens. The grout of ⅛-in. sand was decidedly more difficult to mix properly and showed more tendency to segregate than did the other—a point worth considering in actual construction. In the 'dry-layer' type of construction the bricks show the greater tendency to separate from the concrete. The materials in a dry mix are never associated as intimately as those in a wet mix, and consequently the cement does not come

into as thorough contact with either the sand grains or the brick. The 'dry-layer' is, therefore, weaker than the underlying concrete, and the bond to the brick is not great. . . .

"The monolithic type of construction combines the strength of the brick slab with that of the concrete base in such a manner as to develop the maximum in both, and these tests show that such a compound slab is fully equal in strength to a concrete road slab of the same thickness. It appears, therefore, that in the monolithic brick road the brick and the concrete should not be considered as separate units of a pavement, but rather as integral parts of a single structure. . . . With this type of construction it seems, therefore, entirely logical to reduce the total thickness of the slab, either by reducing the thickness of the base or by using thinner bricks, provided a sufficient gross thickness is retained to furnish strength enough to carry the probable loads, and this necessary gross thickness can be determined on the same basis as the thickness of a concrete road."

Tests on nailed joints in fir and hemlock timbers, H. F. Blood and H. E. Plummer (*Abs. in Engin. News-Rec., 79 (1917), No. 19, pp. 871, 872, figs. 3; West. Engin., 8 (1917), No. 12, pp. 478–483, figs. 8*).—Tests on the strength of nailed joints, using Douglas fir and western hemlock, are reported, which covered 110 joints, 87 with Douglas fir and 23 with western hemlock. All tests were designed to show the strength of nailed joints with wire nails used in single shear.

Safe values for nails driven in perpendicularly to the grain in either wood, with the load perpendicular to the length of the nail, were established as follows: 10 and 12-penny nails, 120 lbs. load value per nail; 16-penny nail, 160 lbs.; 20-penny nail, 200 lbs.; 30-penny nail, 270 lbs.; 40-penny nail, 320 lbs.; 50-penny nail, 400 lbs.; 60-penny nail, 480 lbs.

"For nails driven parallel with the grain of the wood the figures above should be reduced 25 per cent. All of these values should be reduced if the penetration of the nail in the holding piece is less than 50 per cent of its length.

"Other conclusions in the report are that the resistance of nails driven perpendicularly in the timber with the grain of the wood parallel to the load is but little more than for nails driven similarly with the grain of the wood perpendicular to the load. It is also indicated that the standard nail heads are of proper proportions, there being no difficulty with the nail head pulling through the outside timber. The strength of the joint seems to be affected but little by the penetration of the nail in the centerpiece if that penetration is 40 per cent or more of the length of the nail, but with less penetration the loads were reduced, and for a penetration of 30 per cent the strength reduction amounted to about 25 per cent. The examination showed that each nail in a joint seemed to support an equal proportion of the load. . . .

"The resistance of the nailed joint, if depending solely on the resistance of the wood to crushing, varies with the diameter of the nail, other things being unchanged. On the other hand the resistance of the joint, if depending solely on the resistance of the nail to bending, varies as the cube of the diameter of the nail. As the resistance of the joint depends on the combination of these two, various sized nails give varying degrees of resistance, but it is found that the variation of the resistance corresponds quite closely with the square of the diameter of the nail."

Relative resistance of various hardwoods to injection with creosote, C. H. Teesdale and J. D. MacLean (*U. S. Dept. Agr. Bul. 606 (1918), pp. 36, pls. 12, figs. 16*).—Creosote penetration tests similar to those previously reported for coniferous woods (E. S. R., 31, p. 743) are here reported for some of the

more important hardwood species native to this country. The experiments were made at the Forest Products Laboratory maintained by the Forest Service in cooperation with the University of Wisconsin.

The subject matter is discussed under the following general headings: Structure of the hardwoods, methods used in the experiments, apparatus, materials used, method of applying the creosote, factors affecting penetration, effect of structure on penetrance, grouping of species, relation of grouping to commercial treatment, and conclusions. Notes on the characteristics of the various species, together with the results of the tests and a bibliography of related literature are appended.

The farm machinery situation, E. A. White (*Illinois Sta. Circ. 210* (*1918*), *pp. 4*).—The need under present conditions of careful overhauling of farm machinery and early ordering of new machinery and repairs is emphasized.

Gas engine nomenclature (*Gas Engine, 19* (*1917*), *No. 10, pp. 504–513*).—This is the report of the nomenclature division of the data committee of the National Gas Engine Association.

[Magnetos for farm engines], C. V. Hull (*Power Farming, 26* (*1917*), *Nos. 7, pp. 25, 32, 34, figs. 9; 8, pp. 24, 34, 35, figs. 8; 9, pp. 35, 36, 40, figs. 9; 10, pp. 42, 43, 45, figs. 7; 11, pp. 16, 36, 37, figs. 6*).—This is a series of five articles on magnetos for farm engines.

The relations of port area to the power of gas engines and its influence on regulation, J. R. Du Priest (*Gas Engine, 19* (*1917*), *Nos. 7, pp. 357–364; 8, pp. 397–399, figs. 14*).—Experiments are reported the object of which was to present a method of determining the port area required for any fractional load on a throttling gas engine operating on the four-stroke cycle and to suggest a means of so admitting the fuel as to get the same degree of speed regulation throughout the full range of load.

From a consideration of data obtained in tests of a horizontal double-acting tandem throttling engine, operating on natural gas, and the characteristic curve of the governor used, a method was devised by means of which the relation between the travel of the governor collar and port area for a given power can be determined. This is expressed mathematically and by tabular data.

A new fuel for internal-combustion engines (*Brit. Patent 1719* (*1916*), *Mech. Engin., 39* (*1917*), *pp. 313, 314; abs. in Sci. Abs., Sect. B–Elect. Engin., 20* (*1917*), *No. 235, p. 220*).—A British method for starting and running internal-combustion engines is described in which the fuel can be prepared in a plastic state from ingredients independent of oil fields. One composition consists of 41 parts potassium nitrate, 41 parts charcoal, and 18 parts sulphur with moisture to make it plastic. The most important feature is the method for obtaining partial combustion to provide a residue of energy after the first stage, to be used in a second cylinder by the addition of air or oxygen. The second combustion stage may be further subdivided. The products of partial combustion are mainly carbon monoxid, methane, and hydrogen, diluted with nitrogen and carbon dioxid. An example of the use of this fuel is in the starting of an engine for which large air compressors would be necessary. By igniting a cartridge of solid fuel an independent reservoir can be immediately charged with gas at high pressure and used for the engine.

How to lay out and put up a lineshaft, R. H. Smith (*Power Farming, 26* (*1917*), *No. 11, pp. 9, 41, fig. 1*).—The details of this process are here given.

The use of rope on the farm, V. Overholt (*Agr. Col. Ext. Bul.* [*Ohio State Univ.*], *12* (*1916–17*), *No. 5, pp. 48, figs. 137*).—This bulletin is published for the instruction of farmers and students and deals with rope materials and construction; kinds, weight, and strength of rope; coiling and uncoiling of rope;

whipping rope ends; rope splicing; rope halters and halter ties; knots, bends, and hitches; and blocks and tackle. Tabulated data on weights and safe and breaking loads of ropes are included.

Movable hog houses, J. D. McVean and R. E. Hutton (*U. S. Dept. Agr., Office Sec. Circ. 102 (1918), pp. 8, figs. 7*).—The advantages of colony or movable houses are discussed, and instructions, illustrations, and bills of materials for building the box-shaped and A-shaped houses are given.

RURAL ECONOMICS.

Factors of successful farming near Monett, Mo., W. J. Spillman (*U. S. Dept. Agr. Bul. 633 (1918), pp. 28*).—This is a report of a study of 274 farms which have been divided into the following types: Grain and live stock, grain only, grain and fruit, fruit only. The following table gives data showing variations found for these four types:

Effect of type of the farm upon investment, size, and income.

Type of farm.	Number.	Total investment.	Average number acres.	Labor income.
Grain and live stock	116	$11,015	95	$438
Grain	66	7,395	76	192
Grain and fruit	41	7,594	68	410
Fruit	17	4,919	36	294

The author discusses the organization of farms by types, as well as the profitableness of the various types, the proper status of the strawberry industry in southwest Missouri, the speculative nature of fruit enterprises, maintenance of soil fertility, organization of some typical farms, use of legumes, and tenure.

The determination of the cost of production of farm live stock and dairy produce, J. Wyllie (*Scot. Jour. Agr., 1 (1918), No. 1, pp. 15–29*).—The author discusses the various factors to be considered in the cost of producing farm live stock and dairy produce. Among his conclusions are that home-grown feeds should be charged to the stock according to their farm market value; also that special consideration should be given to the valuation of manure from the stock in obtaining the net cost. He outlines various methods that may be used in valuing the manure.

The cost of production of milk, G. A. Ferguson (*Scot. Jour. Agr., 1 (1918), No. 1, pp. 29–33*).—The author outlines a system of bookkeeping designed to obtain the cost of milk, together with the different items that must be maintained in order to obtain accurate accounts. He considers that there should be a record book to be kept by the man in charge of the cow, together with a cash book to be kept by the accountant. He discusses the methods that are to be used in arriving at a fair price for the feeds raised on the farms, the value of the farm manure, and of the live stock at the beginning and the end of the year.

A study of farm labor in California, R. L. Adams and T. R. Kelly (*California Sta. Circ. 193 (1918), pp. 75*).—This report discusses the farm labor shortage in 1917 and the probable situation in 1918. It gives details with reference to wages, living conditions, and sources of labor. The principal part of the report consists of excerpts from reports made to the investigators by various persons in regard to the labor problem.

Cooperative organization by-laws, C. E. Bassett and O. P. Jesness (*U. S. Dept. Agr. Bul. 541* (*1918*), *pp. 23*).—The authors give suggestions in regard to methods of organization, especially to those desiring to meet the requirements of the amendment to the Sherman antitrust law commonly known as the Clayton amendment. They discuss methods of dealing with nonmembers, differences between nonstock and stock forms of organization, financing and perpetuating nonstock organizations, and the relation of this amendment to existing organizations, and have also suggested forms of by-laws for a cooperative nonprofit marketing association formed without capital stock.

Cooperative stores in Minnesota, 1914, E. D. Durand and F. Robotka (*Minnesota Sta. Bul. 171* (*1917*), *pp. 31*, *figs. 4*).—Among the conclusions brought out in this publication are that the number of cooperative stores in Minnesota is about 125, changing very little. About two-thirds of the companies reporting paid dividends. For all stores adequately reported, the average gross sales were $45,836 for 1914, the ratio of expense to gross sales 11.7 per cent, and the ratio of net gain to gross sales, 4.5 per cent. If the success of cooperative stores be measured by the ratio of net profit to gross sales, the factor showing the greatest influence is the ratio of total operating expense to gross sales. The rapidity of turn-over of stock greatly influences success. The size of business has considerable influence upon success, although some successful stores are found in groups of all sizes. In a business of a given size the most efficient management is secured by the managers with the higher salaries.

Modern market methods, A. L. Clark (*N. J. Dept. Agr. Bul. 7* (*1917*), *pp. 215–246*, *pls. 12*).—This bulletin calls attention to the different methods of marketing agricultural products in New Jersey, and points out the factors necessary in any system to be successful. Among these factors are the standardization of grades, packs, and packages, cooperative selling organizations. State regulation of the commission business, municipal promotion of retail marketing, and thrift and more accurate information on the part of housewives.

The mill market for corn and wheat, W. R. Camp (*North Carolina Sta., Farmers' Market Bul.*, *5* (*1918*), *No. 20*, *pp. 10*).—This bulletin contains the usual data with reference to products which the farmers have for sale, together with information regarding the number of mills in the State grinding corn and wheat.

Regulations of the Secretary of Agriculture under the United States Warehouse Act of August 11, 1916.—Regulations for cotton warehouses (*U. S. Dept. Agr., Office Sec. Circ. 94* (*1918*), *pp. 43*).—Regulations promulgated January 4, 1918, are presented. The text of the legislation (E. S. R., 35, p. 308), is appended.

Parcel-post business methods, C. C. Hawbaker and J. W. Law (*U. S. Dept. Agr., Farmers' Bul. 922*, *pp. 20*, *figs. 4*).—This gives detailed suggestions regarding means of obtaining customers and methods of carrying on business, with samples of suitable bills, letterheads, order blanks, and other business forms. It points out that parcel-post shipments are increasing in number, though probably they always will affect only a small percentage of the farm produce going to market. It is concluded that dealings by parcel post should be successful if the farmers are careful to keep up the quality of their produce, pack it safely and attractively, and meet engagements promptly, and the consumer likewise observes business methods in the transaction.

Geography of the world's agriculture, V. C. Finch and O. E. Baker (*U. S. Dept. Agr., Office Sec.*, *1917*, *pp. 149*, *pls. 2*, *figs. 206*).—The purpose of this study is to show the geographic origin of the world's supply of food and of other important agricultural products, and to indicate briefly the climatic, soil,

and economic conditions that account for the distribution of the crops and live stock of the world. The volume contains a series of maps showing, by means of the dot system, the acreage and production of practically all types of agricultural crops and live stock, not only for the United States but for foreign countries, together with brief descriptive accounts as to the principal areas of production. There are also maps showing altitude and precipitation for all countries of the world. An introductory article on The Food Supply of the United States is included, in which it is concluded "that the United States is dependent on the outside world for very few articles of fundamental importance and that the majority of these are supplied by countries in the Western Hemisphere."

Agricultural production for 1918, with special reference to spring planting and to live stock (*U. S. Dept. Agr., Office Sec. Circ. 103* (*1918*), *pp. 22*).—This report contains the Department recommendations with reference to acreage of spring plantings and number of live stock that are deemed necessary in order to feed our own population and to make up the deficit in the food supply of the allies as previously noted (E. S. R., 38, p. 101.)

Prospects of French agriculture, L. Mangin (*Rev. Sci. Paris, 55* (*1917*), *No. 18, pp. 545–553*).—The author discussed the crop situation in France in 1916 as compared with previous years, together with the situation in other countries. In conclusion he advises, in order to meet the present prices, that bread be made containing from 10 to 12 per cent rice flour; that the colonial and other laborers in France be regulated and organized for agricultural purposes; that additional tractors be manufactured and used; that the price of wheat be increased to stimulate production; and that some means be found for increasing the supply of artificial fertilizer. He also suggests that better methods of distribution are needed in certain communities.

Reorganization of agriculture in France, E. Coquidé (*Ani. Sci. Agron., 4. ser., 5* (*1916*), *Nos. 7–9, pp. 393–419: 10–12, pp. 497–543*).—This report deals primarily with the lands which have been devastated by the war. It discusses the methods of reconstruction of the farm buildings, and the necessary agricultural machinery, and also takes up the question of introducing new methods of cultivation and of selling crops and of using waste lands. Attention is given to the questions of social hygiene, eugenics, and the influence of the extensive use of alcohol upon the rural people.

The food of France, D. Bellet (*Paris: Librarie Félix Alcan, 1917,* [*4*]+*. pp. 249*+[7]).—In this report are discussed the food requirements and sources, giving details with reference to meat, fish, cereals, poultry, milk, butter, fruit, and sugar.

Agricultural statistics of Uruguay (*Estadis. Agr.* [*Uruguay*], *1916. pp. IV+164+CCCXLI*).—This issue continues information previously noted (E. S. R., 36, p. 690), by adding data for a later year.

AGRICULTURAL EDUCATION.

Teaching the value of the fundamental sciences to students in animal husbandry, E. S. Savage and L. A. Maynard (*Amer. Soc. Anim. Prod. Proc. 1916, pp. 174–177*).—In this article a plea is made for greater attention to the teaching of the fundamental sciences in training prospective teachers and investigators in animal husbandry.

The value of the fundamental sciences in teaching and in investigation in animal husbandry, E. S. Savage (*Amer. Soc. Anim. Prod. Proc. 1915, pp. 77–81*).—An outline of a suggested 4-year course, with the approximate time to be devoted to each subject, is presented and discussed, indicating the author's

conception of the character and amount of the fundamental sciences necessary in teaching the science and art of animal husbandry and leadership in life.

The curriculum, W. C. Coffey (*Amer. Soc. Anim. Prod. Proc. 1915, pp. 82–93*).—In this paper the author contends that the so-called practical subjects should be retained in the animal husbandry curriculum, but not permitted to dominate it.

Coordination of courses in animal husbandry, C. S. Plumb (*Amer. Soc. Anim. Prod. Proc. 1915, pp. 70–76*).—The author briefly reviews the history of the introduction of animal husbandry courses into the agricultural colleges of this country and discusses the present status of these courses in 14 agricultural colleges in the Central West. He urges that the colleges, in order to strengthen and advance the pedagogical significance of animal husbandry instruction, adopt uniform titles for the same or closely related subjects, cover much the same ground work in all courses having like titles, so arrange the courses as to pass in logical sequence wherever possible from freshman to senior years, clearly define and establish prerequisites when necessary in connection with all courses, and adopt uniformity in credit hours so as to enable the exchange of credits between institutions of comparable rank.

Conventionalism in the teaching of live-stock judging, E. B. Forbes (*Amer. Soc. Anim. Prod. Proc. 1916, pp. 178–185*).—The author submits detailed observations in substantiation of his contention that the present teaching of live-stock judging is not of the highest grade of educational value, because of its lack of scientific basis and of its large measure of conventionalism, and suggests possible methods of improvement in the instruction.

Teaching breed history to advanced students, H. W. Mumford (*Amer. Soc. Anim. Prod. Proc. 1916, pp. 252–259*).—An outline, used in teaching Duroc Jersey history to a class of graduate and advanced undergraduate students, is offered as suggestive of the subject matter of a course in teaching breed history to a rather small group of advanced students specializing in animal husbandry. Helpful equipment and practicums are also suggested.

Home course in soils and soil management, compiled by C. F. Pennewell (*Alameda, Cal.: Compiler, 1917, Books 1, pp. 12; 2, pp. 8; 3, pp. 12; 4, pp. 10; 5, pp. 12; Answers, pp. 14*).—This home course in soils for the rancher consists of a series of five booklets which deal respectively with (1) the origin, formation, and composition of soils, and soil and plant growth; (2) physical properties of the soil; (3) water supply of the soil, and soil temperature and drainage; (4) nitrogen, inoculation, nitrification, green manuring, and crop rotations; and (5) the phosphorus and potassium of soils, and acidity and liming. Answers to the question in each book are added in a separate pamphlet.

Courses in agriculture on the home-project basis (*Ind. Bd. Ed., Ed. Bul. 27 (1917), pp. 395, fig. 1*).—This bulletin contains (1) outlines, subject matter, and references to literature for carrying out home projects in swine production, baby-beef production, sheep raising, colt raising, dairy-cow management, dairy-calf raising, poultry raising, egg production, home gardening (also market and truck gardening and gardening and canning), fruit growing, landscape gardening, potato growing, bee-keeping, and corn production; and (2) outlines of courses in soils and farm crops, respecticely, prepared by M. L. Fisher, for the seventh and eight grades and high school and vocational grades (18 weeks). Directions are given to seventh and eighth grade, high school, and vocational teachers with reference to the amount of work to cover in one year, the selection of projects, and the method of instruction.

Subject matter for 1917–18 in natural history, agriculture, and home making, based on the New York State syllabus for elementary schools (*Cornell Rural School Leaflet, 11 (1917), No. 1, pp. 322, figs. 255*).—This leaflet

is intended as a book of reference and suggestions for teachers, indicating to them what may be learned about a given topic and ways in which boys and girls may be led to gain the knowledge by first-class observation and experience.

Part 1 contains extracts from letters from rural and urban teachers, stating their attitude toward and success in nature-study work; articles by a number of scientific writers on such topics as the Migration of Birds, Keeping Dairy Herd Records, Handling Milk, Biting and Sucking Insects, and Potato Growing; and descriptions of various birds, insects, common farm crops, weeds, trees, etc. Suggestions for using the technical knowledge are contained to some extent in the articles themselves but more largely in editorial notes introducing the various sections.

Part 2, Home Making, consists of a special article on hand sewing, by Julia Gleason, including a few examples of the application of various processes.

Part 3 is devoted to notes and suggestions on the teaching of nature study, physical training, children's gardens, the improvement of school grounds, observations on corn day, a general exhibition for farmers' week in February, 1918, junior home project work, etc. A brief list of reference books on nature study and elementary agriculture, home making, plant life, animal life, etc., is included.

Rural science, including school gardening, R. N. Sheridan (*Dept. Agr. and Tech. Instr. Ireland Jour., 17 (1917), No. 2, pp. 260–263*).—After briefly defining the school garden, the author discusses its evolution and development in Ireland.

A primer of household biology, E. W. Gudger (*Bul. N. C. State Norm. and Indus. Col., 7 (1917), No. 1, pp. 103, figs. 25*).—In this bulletin it is the purpose of the author to give students a sound scientific conception of some of the fundamental principles of biology and a practical knowledge of certain important living things. The plan, which is the outcome of 12 years' teaching of household biology to freshmen students in the State Normal College of North Carolina, began as a course strictly in preparation for domestic science, but has widened its scope to include some of the fundamentals of hygiene and sanitation and of the maintenance of soil fertility. It includes studies of a green alga, an animalcule, yeasts, bacteria, molds, and the cycles of matter. A statement is made at the beginning of each chapter as to where and how the material needed can be obtained.

The States Relations Service and the cooperative extension service, A. C. True (*Gen. Fed. (Women's Clubs) Mag., 17 (1918), No. 1, pp. 19–21, fig. 1*).—The work of the States Relations Service of particular interest to women is discussed. This includes home economics club work and extension activities.

MISCELLANEOUS.

Report on experiment stations and extension work in the United States, 1916 (*U. S. Dept. Agr., Rpt. Agr. Expt. Stas. and Coop. Agr. Ext. Work, U. S., 1916, pp. 334+406, pls. 13*).—This report, prepared by the States Relations Service for the fiscal year ended June 30, 1916, consists of two parts.

Part I. Work and expenditures of the agricultural experiment stations, 1916.—This part includes the usual report on the work and expenditures of the agricultural experiment stations in the United States, including Alaska, Hawaii, Porto Rico, and Guam, together with detailed statistics compiled from official sources as to the organization, revenues, additions to equipment, and expenditures of the stations.

The total income of the experiment stations, including the insular stations, during the fiscal year ended June 30, 1916, was $5,334,073.90. Of this amount

$720,000 was derived under the Hatch Act, $719,999.75 under the Adams Act, $119,978.34 from Federal appropriations for the insular stations, $2,303,824.19 from State appropriations, $17,686.13 from individuals and communities, $335,269.84 from fees, $515,791.47 from the sale of products, and $601,523.96 from miscellaneous sources. The value of additions to the equipment of the stations was estimated at $1,018,976.05, of which $499,345.97 was for buildings.

The stations employed 1,866 persons in the work of administration and inquiry. Of this number 933 were also members of the teaching staff of the colleges and 561 assisted in farmers' institute and other extension work. During the year the stations published 1,733 annual reports, bulletins, and circulars, aggregating 25,923 pages, and these were distributed to 1,147,309 addresses on the regular mailing list.

Part II. Cooperative extension work in agriculture and home economics, 1916.—This part comprises a report on the receipts, expenditures, and results of cooperative extension work in agriculture and home economics in the United States. Of this, pages 17–150 are devoted to Extension Work in the South, pages 151–371 to Extension Work in the North and West, pages 373–375 to Farmers' Institutes in the United States in 1916, by J. M. Stedman, and pages 376–400 to statistics of farmers' institute and extension work.

Thirtieth Annual Report of Alabama College Station, 1917 (*Alabama Col. Sta. Rpt. 1917, pp. 28*).—This contains the organization list, a financial statement for the Federal funds for the fiscal year ended June 30, 1917, and reports of the director and heads of departments on the work of the station during the year. The experimental work reported is for the most part abstracted elsewhere in this issue.

Annual report of the director of the experiment station on work done under the local experiment law in 1917, J. F. Duggar (*Alabama Col. Sta. Circ. 38 (1918), pp. 7–52*).—This includes a report by the director on the progress of the work under this law (E. S. R., 24, p. 400), a financial statement for the year, and reports from heads of departments, including detailed reports of boys' and girls' club work and other extension activities. Experimental work in pig feeding is abstracted on page — of this issue.

Report of Hawaii Station, 1917 (*Hawaii Sta. Rpt. 1917, pp. 56, pls. 8, fig. 1*).—This contains the organization list, a summary by the agronomist in charge as to the work of the year, and reports of the divisions of horticulture, chemistry, plant pathology, agronomy, extension, and Territorial marketing, and of the Glenwood substation. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Monthly Bulletin of the Ohio Experiment Station (*Mo. Bul. Ohio Sta., 3 (1918), No. 2, pp. 31–64, figs. 19*).—This number contains an article entitled Sorghum As a Substitute for Sugar, several other articles abstracted elsewhere in this issue, and miscellaneous notes.

Farm knowledge, edited by E. L. D. Seymour (*Garden City and New York: Doubleday, Page & Co., 1918, vols. 1, pp. XVI+552, pl. 1, figs. 721; 2, pp. XVI+558, pl. 1, figs. 677; 3, pp. XVI+488, pl. 1, figs. 715; 4, pp. XVI+552, pl. 1 figs. 439*).—This is a farmer's cyclopedia, consisting of a large number of special articles, many of which are by agricultural college, experiment station, and U. S. Department of Agriculture officials. Volume 1 deals with farm animals, volume 2 with soils and crops, volume 3 with farm machinery, and volume 4 with farm management.

NOTES.

Delaware College and Station.—The horticultural department is undergoing reorganization. C. A. McCue will retain general direction of all its activities but has been relieved of other station work. It is expected that a research horticulturist will be appointed. R. R. Pailthorp, assistant horticulturist, has resigned to accept a position with the Bureau of Markets of the U. S. Department of Agriculture, with headquarters at Spokane, Wash.

M. L. Nichols, assistant professor of agronomy, has resigned to accept a position at the Virginia College in charge of extension work in farm engineering and has been succeeded by F. M. Rast, jr., assistant professor of soils and fertilizers in the University of Florida. C. E. Neff, assistant agronomist in the station, has resigned to enter military service and has been succeeded by Geoffrey Houghland. Dr. R. D. Mullinix, of the University of Chicago, has been appointed assistant chemist in the station beginning July 1.

Kentucky Station.—S. L. Hibberd, of the department of agronomy, and J. U. Field, field agent in cooperative purchasing and marketing, have resigned. W. H. Simmons, dairy inspector, has been transferred to veterinary work in cooperation with the Bureau of Animal Industry of the U. S. Department of Agriculture.

Louisiana Stations.—The legislature has appropriated $82,000 for the purchase of a college farm. A tract has been selected about three miles from the college grounds which comprises approximately 600 acres of alluvial lands and 500 acres of highlands, or bluff, soil. Practically the entire area is now in cultivation. Plans for the equipment and operation of the farm have not yet been completed, but the property will be taken over by the college of agriculture January 1, 1919, and used for instructional work.

Minnesota University and Station.—The resignations are announced of W. L. Oswald as assistant professor of botany, effective April 18; Ben C. Helmick as assistant professor of agronomy, effective April 1, to become instructor in agronomy and associate agronomist in the Connecticut College and Storrs Station; William Dietrich as assistant professor of animal husbandry and animal husbandman at Crookston, effective May 1, to become county agent at Preston; David O. Spriesterback as research assistant in agricultural biochemistry, effective April 1; and Carl Kurtzweil as assistant in cereal crops, effective April 1. I. D. Charlton, professor of farm engineering, has been placed in charge of the work in army mechanics being given at the training school now in progress at the university farm.

Nevada Station.—Owing to heavy losses where lambs are produced on the open range, a study of methods of increasing the percentage of lambs in Nevada flocks has been planned. Where lambs are produced under sheds, the percentage is as high as from 120 to 130 per cent, while on the range it seldom runs above 85 per cent.

Porto Rico Federal Station.—William P. Snyder, assistant in plant breeding, has been commissioned second lieutenant in the National Army. T. B. McClelland has been promoted to horticulturist and Leonard A. Dalton has been appointed assistant horticulturist.

Rhode Island Station.—Marguerite W. Elkins, assistant in animal breeding and pathology, has resigned.

The Agricultural Experiment Stations of the United States.

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U. S. DEPARTMENT OF AGRICULTURE

STATES RELATIONS SERVICE

A. C. TRUE, DIRECTOR

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U. S. DEPARTMENT OF AGRICULTURE.

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Blacksburg: A. W. Drinkard, jr.[1]
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WISCONSIN—*Madison:* H. L. Russell.[1]
WYOMING—*Laramie:* A. D. Faville.[1]

[1] Director. [2] Agronomist in charge. [3] Animal husbandman in charge. [4] Acting director.

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NOTE.—The abbreviations "Ala. College," "Conn. State," "Mass.," etc., after entries refer to the publications of the respective State experiment stations; "Alaska," "Guam," "Hawaii," and "P.R.," to those of the experiment stations in Alaska, Guam, Hawaii, and Porto Rico; "Can.," to those of the experiment stations in Canada; and "U.S.D.A.," to those of this Department.

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